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Edited by M. R. D. SEAWARD, MSc, PhD, FLS, The University, Bradford

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

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THE YORKSHIRE NATURALISTS' UNION

ASPECTS OF THE HISTORY AND DISTRIBUTION OF POLECATS AND FERRETS IN YORKSHIRE AND ADJACENT AREAS

C. A. HOWES
Museum and Art Gallery, Doncaster

Introduction

Recent archival and literature searches have provided evidence of the past abundance, widespread distribution and subsequent decline of the polecat, *Mustela putorius* L., in Yorkshire and adjacent areas. The history of the introduction and use in Yorkshire of the possibly conspecific domesticated ferret *M. furo* L. was similarly traced. Various forms of persecution and land-use changes are reviewed as possible causes of the polecat's decline, and speculation made regarding the future status of the ferret as a feral species.

A History of the Status and Distribution of the Polecat

Yorkshire

Records of polecats in Yorkshire from 1664 (see Fig 1 and Appendix) and trends in the numbers surrendered for bounty payments (see Fig 3) indicate that this mustelid underwent a pattern of persecution and decline similar to that of the otter *Lutra lutra* (L.).[30] Up to and including the nineteenth century, polecats were apparently widely scattered throughout the five Yorkshire vice counties, though the preponderance of data from VC 63 probably only indicates that West Riding sources were more accessible to the author.

During the 1830s Clarke and Roebuck[7] commented that in Yorkshire 'this species was generally abundant'. Grabham[19] also noted that 'it was not uncommon', a view borne out by numerous mid-nineteenth-century faunal reviews (see Appendix). In Upper Nidderdale it had been 'common',[8] it had 'abounded' in the Carrs around Doncaster prior to their drainage,[26] it had been 'fairly common' around Halifax[39] and was 'widely distributed' in the Sheffield area.[13] In certain districts polecats were indeed abundant, parish records regularly listing the payment of bounties for up to six animals per year. As many as ten were recorded at Bawtry in 1723 and 1731 and at Terrington in 1880. Twenty-four were killed at Cottingham in 1664 and in the parish of Arksey with Bentley between twenty and thirty were killed in the years 1723, 1724, 1732, 1734, 1742, and 1757 with a massive peak of sixty-one killed in 1735 (see Fig 2).

Northumberland and Durham

The 653 polecats recorded killed for bounties between 1677 and 1724 in the parish of Corbridge indicate the abundance of the species in this area of Northumberland.[24] Indeed Mennell and Perkins[38] commented that up to the 1850s polecats were 'still plentiful in both counties'. In Northumberland six were caught in the North Tyne area and one at Harbottle in 1862, and 'a few' were taken in the Cheviots in 1863. Undated records are cited from Chillingham Park and Alnwick.[17] In Co Durham during the 1860s they were 'not infrequently killed in Weardale' and a female with a litter was recorded near Walsingham. Two animals were killed near Middleton-in-Teesdale in 1890 and one was recorded at Cleadon *c*1900.[18]

Cumberland, Westmorland and North Lancashire

Eighteenth-century records came from the parishes of Grayrigg and Underbarrow in Westmorland.[36] In the Lake District the polecat 'enjoyed a very general distribution', being found in 'almost every dale and on all the mosses'. To the north of the district the mosses and flows of the Cumberland plain were regarded as being a stronghold, so too were the mosses to the south, around Morecambe Bay.[37] Harting[24] quotes his correspondent Thomas Farrall as reporting that in 1883 'polecats were plentiful in the district embracing the sandy slopes of the Solway, the mosses of Abbey Holme and the adjoining waste known as Wedholme Flow'.

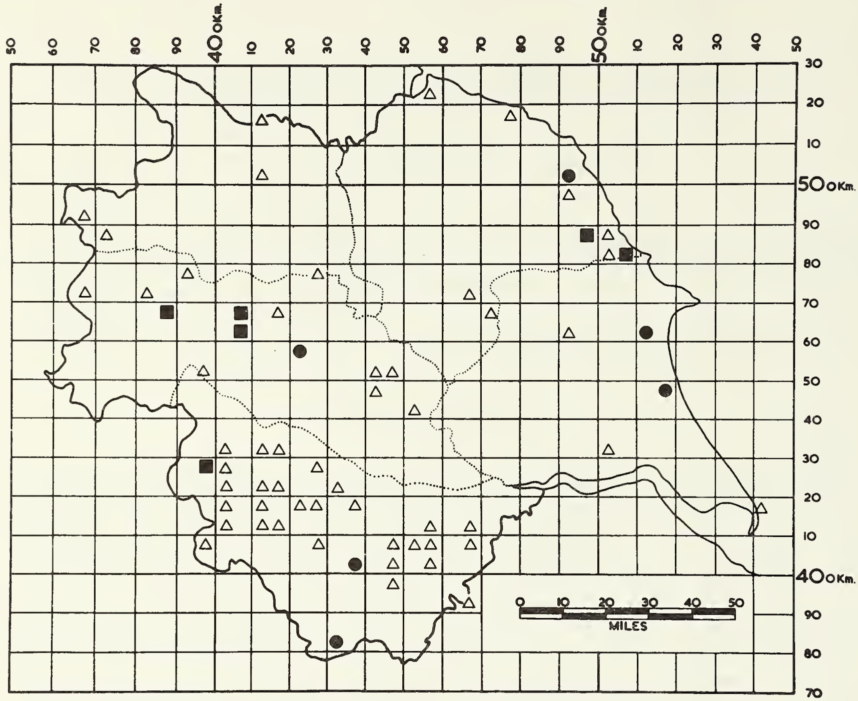

FIGURE 1 Yorkshire polecat records.
△ = pre 1900; ● = 1901–20; ■ = post 1920

Amongst extensive anecdotes, Farrall alluded to polecats being hunted during the 1880s in the Cumberland districts of Aspatria, Ellenborough, Isell, Wigton, Thrustonfield, Allonby, and Cooper, also on the fells above Ambleside in Westmorland, at Newby Bridge, Graythwaite, Hawkshead, and Laughrigg Fell in north Lancashire and during the 1860s around Rochdale and 'the vale and moorland country of north-east Lancashire'.

Derbyshire

Jourdain,[32] referring to the 1850s, noted that polecats were 'very common and widely distributed'. Eighteenth-century records came from Staveley and animals were reported in that district as late as 1892. In 1842 they were 'common' in the Tutbury district and up till 1875 were regarded as 'not uncommon' in the upper part of the Derwent Valley and on the edge of the moors. At Meynell Langley polecats were recorded in 1890, 1896 and 1900 and in the Ashbourne district they were alleged to be still present in 1905[32].

Lincolnshire

Prior to *c* 1875 polecats were 'fairly common in many parts of the county'.[4] One was reported near Grantham in 1882,[24] they were recorded around Grimsby in 1887 and were present in the Mablethorpe district during the early 1900s.[47]

HABITAT AND BEHAVIOUR

Describing its breeding behaviour, the polecat hunters of Cumbria maintained that 'the female polecat generally selects her lair in the autumn, occupies it during the winter and brings forth her young in it in spring. She has usually four to five at a time so that the species multiplies rapidly . . .'[24] Walton[51] however, states that the single annual litter consists of from five to ten young. The lair was said to be composed of 'two distinct parts, one made of leaves for the reception and rearing of young and the other serving as a storehouse for food'.[24]

Hatfield,[26] who derived most of his natural history information from the Doncaster naturalist and taxidermist Hugh Reid (1783–1863), commented that on the Doncaster Carrs it 'did not restrict itself to game but waged war against the inhabitants of river and pond . . . Frogs, toads, newts and fish were amongst the creatures that fell victim . . . Large stores of eels have been found in the larders of the polecat. Even the formidably defended nests of the wild bees are said to yield up their honeyed store to the fearless attack of this rapacious creature'. In Cumberland young rabbits, leverets, partridge chicks, ducklings, larks, frogs, and eels have been found in polecat lairs.[24]

Although some late records refer to upland Pennine and Cumbrian districts, where stone walls[36] and 'rough upland banks'[32] were favoured habitats, most late nineteenth- and early twentieth-century data infers polecats to be lowland or at least valley bottom specialists. In the Lake District it was regarded as being the lowland counterpart of the pine marten *Martes martes* (L.).[36] Jourdain[32] referred to it as occurring in 'the tangled willow beds by the sides of rivers and streams'. In Lincolnshire the coastal marshes of the Mablethorpe and Grimsby districts seem to have been a last stronghold[47] and Cordeaux[12] claimed to have found evidence of its presence in the sand dunes of Spurn, east Yorkshire.

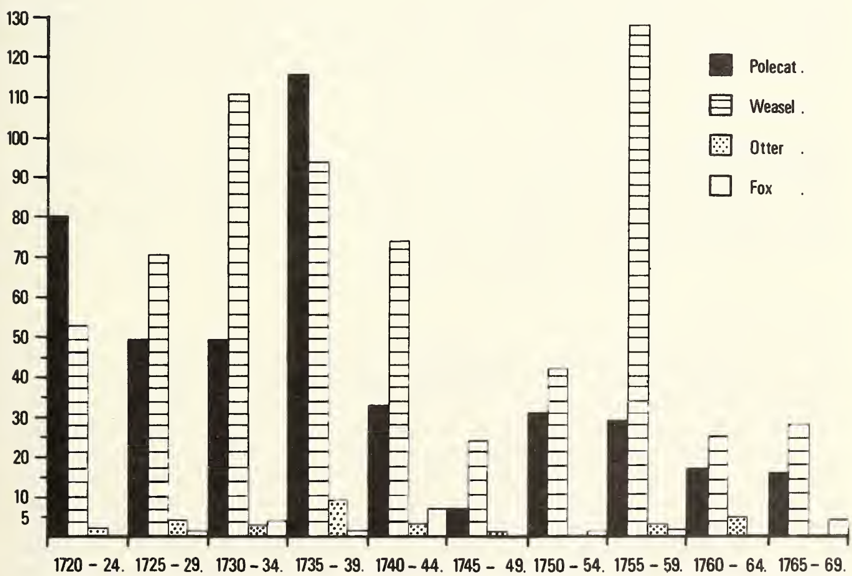

FIGURE 2

Total numbers of surviving records of bounties paid for polecats, weasels, otters and foxes in the parish of Arksey, South Yorkshire during five-year periods from 1720 to 1769.

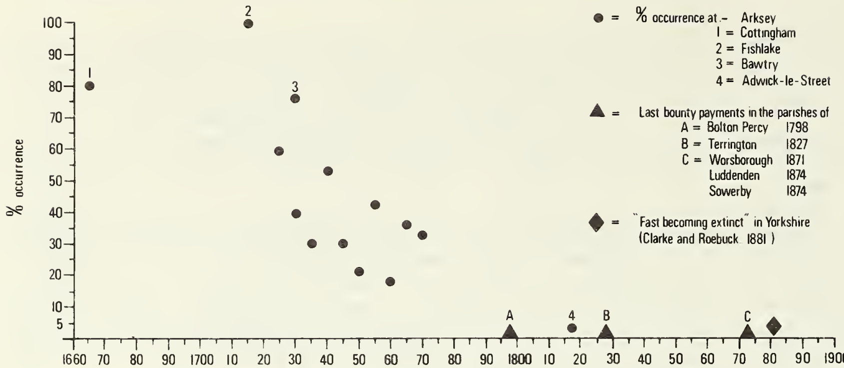

FIGURE 3

The declining status of the polecat in Yorkshire as shown by plotting (A) polecat bounties per five-year period, (B) the last recorded dates for the payment of polecat bounties and (C) the publication date of the statement of the polecat's impending extinction.

In Cumberland,[36] Lincolnshire[4] and Derbyshire,[32] polecats were also associated with woodland which was considered to be a summer habitat. They were also known to frequent barns and outhouses,[32] doubtless attracted by rodent pests of stored agricultural products, though 'The poultry yards of Abbey Holme farms (Cumberland) suffer much from the depredations of foumarts'.[24] On 3 March 1849, a polecat entered a house at Trafalgar, Halifax[36] and 'two or three were caught in the bottom of a haystack at Red House Farm, Wilstrop, in 1886.[50] Today this synanthropic trait would be attributed to escaped ferrets.

Persecution

The reasons for the decline and evident extinction of polecats in the north of England is not exactly known; however, a review of factors associated with persecution and land-use changes may throw light on the possible causes and therefore help in its conservation in areas where it still survives.

The Fur Trade

Hatfield[26] commented that the fur of the polecat being of a 'beautiful texture, would be nearly as valuable as sable but for the difficulty attendant upon the removal of the very disagreeable odour. Indeed, it may have become scarce much earlier were this not the case.' Although trapped for its pelt (fitch), during the late 1400s the fur trade did not represent a major threat to English polecat populations — other furs, possibly for the reason mentioned by Hatfield, being vastly more popular and prestigious.[49] Later, however, with 'martin' *Martes martes* (L.), which provided one of the most sought-after 'home grown' luxury furs, becoming too scarce in England to meet the rising demand for their pelts, the trade turned to 'fitch' as a cheap substitute. Evidence of its regular use is in the Ordinances of the Skinners of the City of York[43] where in 1500 charges were set out for the preparation of polecat skins. Demand was also increased when sable *M. zibellina* (L.) from the forests of Scandinavia and northern Russia became, by contemporary standards, fabulously expensive, costing £2 per pelt during the 1400s, and the sumptuary laws restricted its use to Royalty.[49] Fitch was thus used in lieu of sable and 'marten', eg in the civic finery of Mayors, Sheriffs and Aldermen — indeed Veals[49] mentions an Alderman in 1516 owning a gown furred entirely with 'fitch'.

The high demand for 'marten' pelts during the late Middle Ages could have helped reduce English populations to the point where it became necessary to import them from Wales, Scotland and eventually Scandinavia and northern Europe. The subsequent swing to the use of 'fitch' apparently did not similarly affect polecat populations, as up to the mid-nineteenth-century they were still generally abundant.

During the eighteenth and nineteenth centuries many 'fitch' pelts would have been available to the trade via the vigilant game keeper; Hatfield[26] in 1866 notes that 'skins found customers at 1 shilling each'.

During the mid-1800s locally obtained polecat pelts suddenly became scarce, the volume of trade in fitch at the Dumfries fur market, which received pelts from Northumberland and Cumberland, illustrating this phenomenon. In 1829 400 pelts were sold, in 1831 600 and in 1840 pelts were sold in 'considerable numbers'. However, by 1854 they were 'getting scarcer', in 1858 they were 'very scarce' and the last recorded sale was of 'a dozen only' in 1866.[24] As the decline in sales was accompanied by a considerable increase in price — from 12 shillings to 36 shillings per 'furriers dozen' over the period indicated — the decline in sales would appear to be due to a genuine scarcity rather than to a fall in demand. To illustrate the continuing demand for 'fitch', at least from the nineteenth century, polecat hair has been extensively used in quality 'sable' paint brushes. For this and other purposes 77,578 polecat pelts were sold on the London fur market during the trading year 1905–06, though by this date most, if not all of the pelts would have come from suppliers in Denmark, Holland, Germany, and Russia.[42]

Hunting for Sport

Georgian England witnessed the rise and sophistication of fighting, baiting, hunting, and shooting of many animals for sport. Polecat hunting apparently only attracted a small following and probably had little more than a local and sporadic effect on populations. Polecats were hunted in Dorset during the eighteenth century.[33] In North Wales, they were regularly hunted in Merionethshire and Montgomeryshire during the late nineteenth century[24] and in the Lake District, Macpherson[36] reports that to the 'active yeoman' the polecat 'was an object of admiration because of the sport it offered to their hounds'. For Cumberland, Harting[24] gives extensive information on hunting packs and the districts in which they worked during the fifty years up to 1883. He also notes that 'At a wayside inn near Maryport is a splendid case of stuffed polecats killed by the Ellensborough hunt'.

In South Yorkshire during the early 1800s Hatfield[26] tells of 'James Thornton and James Taylor of Doncaster who used to hunt the polecat with two or three good terriers. They seldom returned without securing a dozen and not unfrequently a score during a visit.' Although this would seem to be an excessively high number, high annual totals in parish records could give credence to these claims; also, during the spring, the destruction of polecat lairs containing young would help to achieve these high totals.

Game Keeping

'The stinking polecat, shunned by most people and persecuted by all.' These words of Charles Waterton (1782–1865)[56] illustrate the eighteenth- and nineteenth-century attitude towards this predator.

The effects of game keeping and in particular the rearing of pheasants seem to have had a significant influence on the fate of the polecat in Britain. In England, the 'common' pheasant *Phasianus c. colchicus* L., a native of Asia Minor, had from before the Norman conquest been bred in captivity both for ornament and food. However, by the late fifteenth century it had become naturalized and an act was passed granting it protection — its sporting potential having been realized.[35] An early Yorkshire record is of pheasants from the Selby warren being feasted upon at Selby Abbey in 1416–17.[23] Over the next 400 years a series of historical events elevated the pheasant to being the most important game species in Britain, its management developing into a major rural industry.

With the restoration of the monarchy in 1660, the 'sporting upper classes' were re-established in the country estates, giving fresh stimulus to sporting pursuits generally. From

the seventeenth to the nineteenth century the development of guns and ammunition specifically for sporting purposes made shooting simpler, safer and more predictable, thus greatly increasing its popularity as a recreation. Being essentially a class sport, the social standing of a landowner was enhanced by his ability to provide good and eventful shooting for his guests. For this fashionable facility, the craft of game keeping evolved: teams of game keepers being employed at estates throughout Britain for the purpose of rearing game birds and for the destruction of their predators, both real and alleged.

Indicative of the improvement of game management techniques was the growth of trade between estates in pheasant stocks; indeed stocks were exported to the colonies, eg North America in 1790'[1] while oriental forms were imported to add interest and vitality to the naturalized population. The 'Japanese' pheasant *P. c. versicolor* Viellot was introduced in 1741, the 'Chinese ring-necked' pheasant *P. c. torquatus* Gmelin, not uncommon in aviaries in the 1780s, had become established in the wild by the 1820s[35] and the 'Mongolian ring-necked' pheasant *P. c. mongolicus* Brandt was introduced into feral stocks during the nineteenth century.[14]

The polecat's reputation as a predator of game birds and particularly of young pheasants rendered it an obvious target for the game keeper; indeed in some quarters foxes *Vulpes vulpes* L. were encouraged on the grounds that they were thought to kill polecats.[33]

During the mid-1700s the gin trap was added to the game keeper's armoury and proved to be a landmark in the history of 'vermin' control. Up till the 1880s the use of the gin trap had been legally restricted to those employed in game rearing; however the ground game laws of that year made it possible for farmers and their employees to use these traps to protect their crops from the vast and highly destructive populations of rabbits *Oryctolagus cuniculus* (L.). Paradoxically, with the new found income from rabbit (coney) skins and meat, farm workers were encouraged to conserve rabbits by controlling their predators, thus polecats which 'inhabit rabbit warrens and are very destructive'[32] became increasingly persecuted. In Cumberland polecats were locally exterminated by the use of rabbit traps[37] and it was noticed in Lincolnshire that they survived better in areas free of rabbits.[24]

As with pheasant shoots, developments in grouse moor management no doubt also played a significant part in polecat eradication in upland districts. Up to the late 1600s red grouse *Lagopus scoticus* L. were taken in relatively small numbers, being caught by hawk or flushed into nets. Later, birds were shot either on the ground or after being flushed by dogs. During the early 1800s, a technique was evolved whereby grouse were driven before waiting guns and shot on the wing.[40] This revolutionary method, which enormously increased the numbers of birds shot, quickly became the vogue and consequently put pressure on keepers to rear sufficient new stock to satisfy the potential of this highly efficient form of shooting. In the process the predator/prey ecology of the Pennine and North Yorkshire heather moors was radically altered. Upland species like the hen harrier *Circus cyaneus* (L.) suffered the 'onslaught of the gamekeepers', becoming scarce by 1844 and being reduced to the status of a bird of passage by 1906,[40] and 'the almost complete loss to the country of the common buzzard *Buteo buteo* (L.) as a breeding species is another price paid . . . for the supposed benefits of sportsmen'.[6]

Significantly, predators suffered less in areas not controlled by keepers or at times when game keeping was relaxed. Chislett[6] remarked that the sparrow hawk *Accipiter nisus* (L.) fared better 'in areas not keepered' and 'gained temporarily in status' during the two World Wars. Similarly Harting's correspondents[24] observed that in Lincolnshire polecats fared better 'where game was not preserved'. A small batch of Yorkshire polecat records were made soon after the end of the Second World War (see Appendix). Their validity, however, is considered suspect and the general revival of the species inferred by Batten[3] appears not to have continued in Yorkshire, though Welsh populations have greatly increased and have spread into adjacent English counties.[51]

Change of Habitat

The enclosure awards from the mid-eighteenth to the mid-nineteenth century had a profound effect on the pattern of the Yorkshire landscape, bringing vast areas of 'wild'

countryside under agricultural and game management. Drainage and land improvement schemes, often undertaken with a view to enclosure, also flourished during this period. The drainage and first attempts to cultivate the Doncaster Carrs commenced during the mid-1700s, a period when similar schemes were being undertaken in wetland areas throughout lowland Yorkshire. These developments coincided with the disappearance as breeding species of the bittern *Botaurus stellaris* (L.) 'which deserted the (Doncaster) Carrs about the year 1750'[26] and the marsh harrier *Circus aeruginosus* (L.) 'which formerly bred on the wastes around Doncaster and the East Riding' but was 'compelled to retreat before the spread of agriculture and the misplaced zeal of the game preserver'.[40]

With polecats showing a lowland and often water-side preference, preying on a wide range of aquatic vertebrates, they were no doubt hard hit by these revolutionary changes. Hatfield,[26] discussing the decline of the polecat on the Doncaster Carrs, claimed that 'the cultivation of the land has been a most formidable enemy in its destruction'.

Bounty Payments

To further encourage the persecution of polecats, from the sixteenth to the nineteenth century, parish authorities offered a bounty, usually of 4d, for polecat heads, bounty payments being recorded in the accounts of either the church wardens, parish constables or the overseers of the poor. To date the payments of polecat bounties have been located in the records of nineteen Yorkshire parishes (see Appendix). They were recorded under a variety of names, most being based on the old English name, 'foulmart'. The term polecat, apparently more widely used in the South of England,[23] was first used, if briefly, in these records in 1752. As no mention is made of stoats *Mustela erminea* it is assumed that these were classified as weasels *M. nivalis.* Proof to the contrary would of course invalidate the following findings. One can also speculate that stoats may have been rarer during the period of polecat abundance. Up to the mid-1700s records of bounties paid for polecat heads were numerous and often outnumbered those for all other mammal species. In 1664 in the parish of Cottingham, polecats (n = 24) accounted for 80 per cent of the mustelids surrendered for bounties. At Fishlake between 1710 and 1714 polecats (n = 14) were the only mustelids recorded and at Bawtry between 1723 and 1737 (ten complete years recorded) they represented 76 per cent (n = 57) of the mustelids recorded.

The most extensive series of vermin records examined to date is from the church warden's accounts of the parish of Arksey with Bentley and covers the period 1719–74. Fig 2 shows the actual numbers of all carnivores recorded, grouped for convenience in five-year periods. As yearly fluctuations are affected by the varying completeness of the records and as fluctuations could also have been caused by vermin eradication schemes or by financial hardship of the parish poor, records of polecats for the five-year periods have been expressed as a percentage of the total mustelids recorded for those periods (see Fig 3).

Population Decline

Well before naturalists began to notice a decline, the Arksey data suggests that a decline was already in progress through the mid- and late-1700s. This trend is emphasized by comparison with data from other parishes (see Fig 3). A general drop in annual tolls of polecats and a decline in their frequency relative to the numbers of other mustelids was monitored elsewhere in Yorkshire during the early nineteenth century. At Terrington from 1802 to 1812 twenty-nine polecats were recorded, between 1813 and 1821 there were fourteen and between 1822 and 1832 only six, the last entry being in 1827. At Adwick-le-Street only one polecat (3.7 per cent of total mustelids) was recorded between 1817 and 1822 and at Fishlake none were recorded during the twenty years for which parish records still survive between 1811 and 1894. Although in some parishes polecat bounties were still being paid during the mid- and late-1800s, these were few, the last located to date being from Worsborough in 1871 and Luddenden and Sowerby in 1874.

By the mid-nineteenth century the polecat decline was being generally noticed, Clarke and Roebuck in 1881[7] reporting it to be 'irregularly distributed, extremely rare and fast

becoming extinct'. A review of comments in the appendix from the 1860s more closely monitors its decline in specific districts.

The polecat 'era' in Yorkshire came to a close in 1928 when Riley Rotrune[16] declared that the polecat was 'now regarded as extinct in the county', subsequent reports being attributed to escaped ferrets or feral polecat/ferret hybrids. Batten[3] however, was convinced, by coloration and size, of the validity of specimens in the Grimwith district from *c* 1900 to *c* 1945 and from Forge Valley *c* 1945 (see Appendix). If authentic, these would give support to records from Cayton in June 1939,[11 and 12] Hebden Valley in 1939[27] and Malham Moor in 1945.[28]

In other northern counties the pattern and period of decline was similar. The last Northumberland record was in about 1910, and it was thought to have died out in Durham during the 1890s.[18] In Derbyshire it was 'not uncommon' in the north-west of the county 'as late as 1860–1876' but generally numbers had decreased rapidly during the latter half of the nineteenth century, it being considered 'practically extinct' by 1905.[32] In Lincolnshire a rapid decline had been noticed from 1875 and by 1912 it was 'practically extinct in many of its former haunts'[4] the last record to hand being from Louth in 1910.[48] Although considered extinct in south-east Cumberland by 1901, the Solway mosses were still regarded as a refuge.[24 36 and 37] A rapid decline in the North Lancashire and Westmorland population took place during the latter half of the nineteenth century, though in Westmorland it survived in the Tebay area as late as 1912 (YNU Circular no 240).

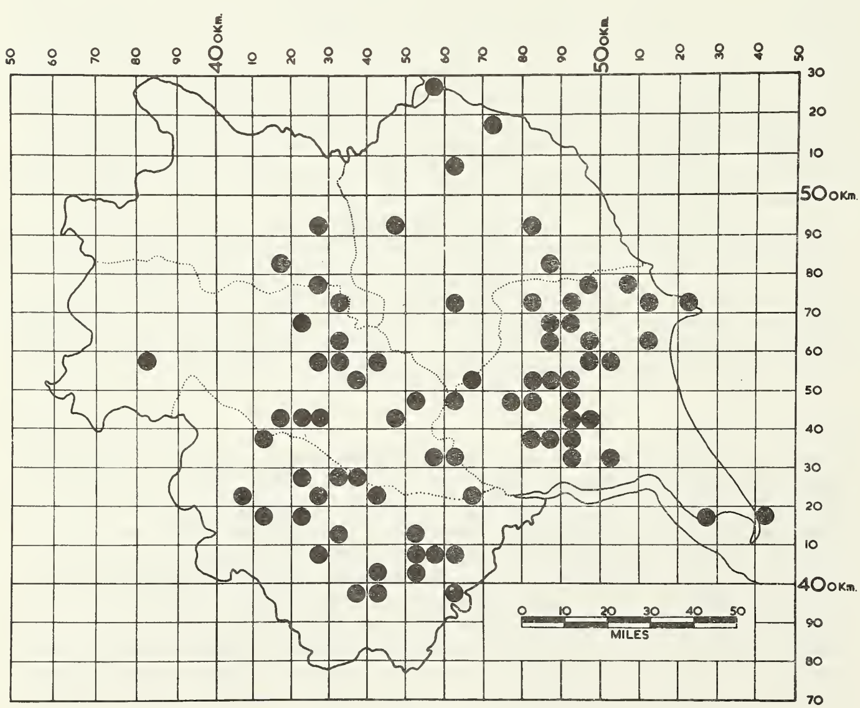

FIGURE 4

Distribution of old rabbit warrens in Yorkshire.

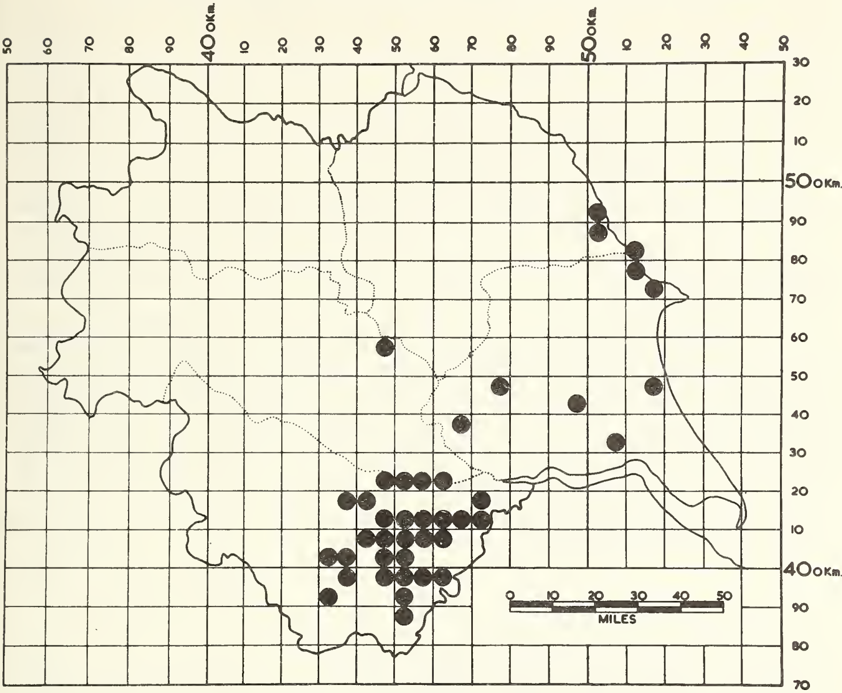

FIGURE 5

Records of polecat/ferrets in Yorkshire from 1970.

NOTES ON THE HISTORY OF THE FERRET IN YORKSHIRE

Since the domesticated ferret *Mustela furo* L. is interfertile with the polecat and as some dark forms of polecat/ferret hybrids are externally indistinguishable from polecats,[51] confusion has occurred in the monitoring of the status and history of the indigenous polecat, particularly since the late nineteenth century.

The ferret, described by Conrad Gesner in 1555 as being the colour of urine stained wool, is the product of selective breeding of albino polecats, white animals being chosen due to their visibility in the twilight when used to catch or flush rabbits.[35] It is however, a matter of debate as to whether *M. putorius* L. or *M. eversmanni* Lesson was used for domestication and indeed whether these two are conspecific.[51]

Owen[41] has traced the domestication of the ferret back to 63 BC and its use in Britain from 1223 where it was already a vital feature of medieval rabbit warren exploitation. As rabbit warrens are recorded in Yorkshire at least from 1232 (Howes, in prep) it is probable that ferrets were used from this time — the earliest reference to ferrets in Yorkshire is of them being used by rabbit poachers in 1389.[45] Its use by both warreners and poachers became commonplace in Britain by 1391 when a law was passed limiting the ownership of ferrets to those with an annual income of not less than 40 shillings. This was construed by Owen[41] as a move to curtail an increase in illegal ferreting by the lower classes.

With such an extensive history of ferret keeping in Yorkshire, there could well have been many occasions when animals escaped and interbred with indigenous polecats. Indeed

Fitter[15] quotes Dr L. Harrison Matthews as saying that 'perhaps there are . . . no pure bred wild polecats left'. Fig 4 which includes data from Harris[23] and the results of extensive cartographic, archival and place-name studies, summarizes a preliminary survey of commercial rabbit warrens in Yorkshire and indicates the sites from which ferrets could have escaped. Although a wide distribution is shown, evidence of warrens has not been traced in the western and north-eastern extremities of the county, a feature which could possibly lend weight to the validity of polecat records in these areas.

Today, ferrets are widely kept as 'working' pets, animals being offered for sale in pet shops, from market stalls and from numerous 'back garden' breeders throughout Yorkshire. Escapees from captivity and from rabbit hunting forays are frequently reported, mainly from the rural fringes of urban and particularly coal mining areas, Fig 5 graphically showing the concentration of records in the South Yorkshire coalfield where there has long been a strong tradition in ferret keeping.

It is not known how long ferrets survive in the wild. Some are relocated in the same warrens several months after their escape, though animals lost in regularly worked warrens are probably claimed by other ferreters and do not get the opportunity to 'go wild'. It is strange, however, that there is so little evidence of the establishment of feral populations. In 1890 Graves[20] listed ferrets as part of the Cleveland fauna, though this could merely refer to tame animals being kept in the area. Colin Simms (*pers comm* 1975) has located a viable population in North Yorkshire and in 1975 a white ferret was seen in a North Nottinghamshire gravel pit carrying young in its mouth.

Elsewhere, feral populations are known from the Isle of Man, Anglesey, Renfrewshire and a population was established on Mull up till at least 1951.[51]

NOTES

1 Austin, O L (1961) *Birds of the World.* Hamlyn, London.

2 Barry, J W (1907) Notes of the changes among animals in Fylingdales, north-east Yorkshire. *Naturalist*, pp 307–9.

3 Batten, H M (1952) *British Wild Animals.* Odhams, London.

4 Blathwayt, Rev F L (1912) A preliminary list of Lincolnshire mammalia. *Trans Lincs Nat Un,* **3**, pp 60–7.

5 Booth, H B (1939) An old Wakefield record of the polecat. *Naturalist*, p 208.

6 Chislett, R (1952) *Yorkshire Birds.* Brown, Hull.

7 Clarke, W E and Roebuck, W D (1881) *A Handbook of the Vertebrate Fauna of Yorkshire.* Lovell Reeve, London.

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APPENDIX

* Date of publication only

Date	*Locality and grid ref*	*Notes*	*Source*
1664	Cottingham TA 0432	Parish records	(31)
1680	Bradford SE 1633	Parish records	(45)
1680	Bolling SE 1531	Parish records	(48)
1680	Horton SE 1431	Parish records	(48)
1680	Manningham SE 1534	Parish records	(48)
1682	Wakefield SE 3320	Parish records	(45)
1704, 1706, 1830, and 1871	Worsborough SE 3503	Parish records	(52)
1710–14	Fishlake SE 6513	Parish records	Sheffield City Archives
1719–75	Arksey SE 5706	Parish records	Sheffield City Archives
1723–37	Bawtry SK 6593	Parish records	Cusworth Hall Museum
1724	Wath and Swinton SK 49	Parish records	Sheffield City Archives
1773–1814	Thurstonland SE 1610	Parish records	Tolson Memorial Museum records
1774–76	Scarborough TA 0388	Parish records	(9)
1787–1874	Luddenden SE 0426	Parish records	(39)
1787–1874	Sowerby SE 0423	Parish records	(39)
1788, 1789, 1795, and 1798	Bolton Percy SE 5341	Parish records	(45)
1802–27	Terrington SE 6770	Parish records	(54)
* Early 1800s	Cleveland NZ 52	Listed for the area	(20)
1808–27	Skipton SD 9851	Parish records	(48)
1811	East Ardsley SE 2925	Parish records	(45)
1822	Adwick-le-Street SE 5408	Parish records	Sheffield City Archives
1836	Walton Park SE 3616	Specimen in the Waterton Collection	(5)
* 1842	Askern SE 5513	Listed for the area	(34)
1849	Halifax SE 02		(39)
* 1859	Fixby SE 1319		(29)
* 1858	Kirklees SE 1723		(29)
* 1859	Whitley SE 2218		(29)
1860	Sowerby Moor SE 0223		(39)
c 1860	'Fly Flatts' SE 0231	One trapped	(39)
1861–62	Clowes Moor SE 0211	Three trapped during the winter	(21)
* 1866	Doncaster Carrs SE 5900		(26)
1868	Hooton Pagnell SE 4807	Two shot	(46)
1869	Cudworth Pasture SE 0211	One killed by a dog	(21)
1870	Marr Wood SE 4905	Specimen (now destroyed) presented to Doncaster Museum	
1875	Strangsty Wood SE 1120	One caught	(21)
1875	Three Nunns, Kirklees SE 1722	One seen	(21)

Date	*Locality and grid ref*	*Notes*	*Source*
1876	Rishworth SE 0218	One male trapped 'none heard of since'	(21)
1878	Greenfield SD 90	One trapped	(21)
1878	Stanley SE 3423	Specimen noted in Wakefield Museum catalogue	
*1880	Ingmanthorpe SE 4250		(YNU Circular June 1880 and (50))
1882	Scarborough TA 08	Last date known for district by W J Clarke	(9)
1884	Marsden Moor SE 0310	Male trapped in February and female trapped in March	(22)
1884	Spurn TA 41	Tracks found by John Cordeaux	(YNU Circular, September 1884)
*1885	Nidderdale SE 16	'A species of the past . . . though may still survive	(YNU Circular no 63 and (8))
1886	Wilstrop SE 4854	Two or three caught in haystack	(50)
1887	Jugger How Beck SE 9399	Five specimens seen	(10)
*1887	Sedbergh SD 6692		(YNU Circular no 68)
*1887	Hatfield Chase SE 69	Two undated local specimens in the collection of the Vicar of Hatfield	(YNU Circular no 70 and *Naturalist* (1888) 83–9)
*1888	Saddleworth SD 9905		(YNU Circular no 73)
*1889	Kirkham Abbey SE 7365		(YNU Circular no 82)
*1891	Sledmere SE 9364		(YNU Circular no 93)
*1891	Langstrothdale SD 97	'Occurred sparingly within the memory of the older inhabitants . . . is now probably extinct'	(53)
*1892	Horton-in-Ribblesdale SD 8172	'Formerly found . . . does not now occur'	(YNU Circular no 96)
1894	Seamer Carrs TA 0382	'Rare'	(44)
*1896	Staithes NZ 7818	'Common once . . . rare now'	(YNU Circular no 126)
*1897	Boston Spa SE 4245		(YNU Circular no 129)
*1897	Cotherstone NZ 0119	'Formerly common but now almost extinct'	(YNU Circular no 131)
*1898	Inglebrough SD 6973	'Formerly'	(YNU Circular no 136)
*1899	Dent SD 7086		(YNU Circular no 143)
*1900	Crosland Hall SE 1114	'Rare'	(YNU Circular no 152)
*1900	Arkengarthdale NZ 10	Common about the middle of the nineteenth century, 'appear to be extinct at present time'	(YNU Circular no 153)

Date	*Locality and grid ref*	*Notes*	*Source*
Early 1900s	Grimwith SE 0664	Two or three corpses hanging on barn door at Grimwith House, also specimen observed at close range and shot at	(3)
1903	Darley SE 2059	One shot	(48)
1903	Fyling Hall NZ 9304	One trapped 'used to appear on keeper's lists'	(2)
* 1904	Hebden Bridge SD 9827	'Still occasionally met with'	(YNU Circular no 179)
1907	Ramsdale NZ 9203	'Still present'	(48)
* 1907	Burton Agnes TA 1063	Undated specimen in collection of Sir Wickham Boynton	(19)
* 1909	Cawthorne SE 2807	'Formerly to be found but now probably extinct'	(YNU Circular no 219)
1910	Wassand TA 1746		(48)
* 1910	Sheffield area SK 38	'. . . on the verge of extinction'	(13)
1912	Tanfield SE 2678	'A recent unconfirmed record'	(YNU Circular no 238)
1939	Killerby Hall, Cayton TA 0682	Regarded as probable polecat/ ferret	(11 and 27)
1939	Hebden Valley SD 9827	Regarded as probable polecat/ ferret	(27)
c 1935	Grimwith SE 0664	One shot as it swam in Grimwith reservoir	(3)
c 1945	Appletreewick Moor SE 0765	Reappeared on the moors above the reservoir	(3)
c 1945	Forge Valley SE 9886		(3)
1945	Malham Moor SD 8867	One trapped. Regarded as probable polecat/ferret	(28)

BOOK REVIEW

Plants and Beekeeping by **F. N. Howes**. Pp. 236. Faber & Faber. 1979. £3.95 paperback
Divided into three sections Dr. Howes' book includes, in the first, an account of nectar, its sites of production in different plants and the factors affecting its production. The nature and quality of honey in relation to the plants from which it is derived, and the use bees make of pollen are dealt with. The merits of the hive bee as a pollinator and the dependence of some commercial crops on its activities are emphasized. Hints for the design and planting of a bee garden and apiary hedges are provided. Propolis and honeydew are discussed.

The second section is devoted to major honey plants, wild and cultivated, their usefulness to bees, the type of honey derived from each and the principal localities where these plants are found. This is not a botanical text; the descriptions and remarks on habitats of wild species are presented as reminders rather than as guides for identification.

The third section, taking up the major part of the book, is entitled 'Other plants visited by the honey bee.' The plants are presented alphabetically using common names (scientific names are also given). As in the previous section the notes are useful only as reminders. Many fascinating snippets of information and apt quotations are offered to make this section, like the rest of the book, thoroughly readable; it also includes a useful bibliography. From the viewpoint of a prospective bee-keeper and keen gardener this book is well worth having. My only serious criticism is of some duplication of information between sections.

JMD

AN OCCURRENCE OF HALOPHILIC DIATOMS IN A FRESHWATER HABITAT IN CAMBRIDGE

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During a study of the algae of the River Cam and its marshes, a remarkable association of salt-loving diatoms was found in a ditch on Coe Fen, Cambridge, Nat Grid TL/447 573. The area sampled forms the dead end of a fen ditch which is permanent and eventually joins the Cam. It is so shallow and clogged with vegetation in parts, however, that except in periods of flood, the water in it is probably derived almost entirely from rain and surface run-off from the adjacent grassland. The end under consideration is about 2 m in width, with a bottom of bare mud lying about 50 cm below field level. The depth of the water, even after rainy weather, seldom exceeds 8 cm. In dry periods the water gradually evaporates so that the mud becomes exposed and eventually dries out completely. While in a semi-dry state the area is much puddled by mallard ducks and is also pitted by the hooves of cattle and horses. In November 1978 the bed of the ditch was nearly dry but the hoof-prints held water up to 3 cm deep. The bottoms of these and the surface of the damp mud between them was covered with a continuous brown gelatinous layer, which proved to be made up almost entirely of diatoms.

A combined water sample was collected by pipette and analysed by the chemistry section of the Institute of Terrestrial Ecology. Scrapings of the brown layer showed the diatoms to be dominated by *Nitzschia tryblionella*, all the cells being alive and actively motile. Counts were made on four samples by means of transects across thinly strewn slides mounted in 'naphrax'. Further samples of diatoms were taken for comparison in February and April 1979.

The results from the transects of the November samples are expressed in Table 1. The first column after the names of species, 'Assessment', indicates a category of salinity preference

TABLE 1

Species	Assessment	A	B	C	D	Av
Nitzschia tryblionella	mesohalobous	27	50	61	35	44
Navicula pygmaea	mesohalobous	10	11	10	13	11
Surirella ovalis	mesohalobous	7	2	3	3	4
Nitzschia hungarica	mesohalobous	10	5	—	—	4
Navicula cryptocephala	indifferent	11	—	2	2	4
Nitzschia tryblionella var. *levidensis*	mesohalobous	4	4	2	2	3
Navicula rhynchocephala	indifferent	4	2	2	3	3
Total % mesohalobous spp		60	72	76	56	66
Total % halophilous spp		7	6	9	9	7.75
Total % indifferent spp		30	21	13	32	24
Total % unassessed spp		3	1	2	3	2.25

Percentage of species present in four samples, A, B, C, D collected from Coe Fen in November 1978. The assessments are taken from Petersen (1943) except those for *Nitzschia tryblionella* (from Foged, 1977) and its variety *levidensis* (from Hustedt, 1930, who says that the varieties occur with the type). Only species with an average frequency of more than 2.5 per cent are included.

according to a scale devised by Kolbe (1927) to show the reaction of different species to varying salinity. Using Kolbe's scale, Petersen (1943) produced a list of species and introduced the terms 'mesohalobous' and 'halophilous' to apply to those thought to favour $5-20^{0}/_{00}$ (parts per thousand) and less than $5^{0}/_{00}$ respectively. In the latter group the salinity is assumed still to be appreciable (and measurable) and Petersen put the lower limit of the preferred range of halophilous diatoms at $0.18^{0}/_{00}$. Other terms in this system are 'indifferent', which is self-explanatory, and 'unassessed', which we are using for those diatoms which Petersen did not assign to a group. Sometimes we have been able to place a species, based on the work of other investigators, and the above terminology is useful in comparing different populations.

The species recorded in the four November samples are listed in order of average frequency, above an arbitrary level of 2.5 per cent, to simplify the table. Below these appear the total percentages for mesohalobous, halophilous, indifferent and unassessed species. Petersen's category of 'halophobous' (for diatoms intolerant of any salt) is not represented.

It can be seen that all four of the November samples show a preponderance of two mesohalobous species, *Nitzschia tryblionella* and *Navicula pygmaea*, which together account for 55 per cent of the average. This would indicate a habitat of considerable salinity, which is borne out to some extent by the chemical analysis. The total dissolved matter was 1400ppm or $1.4^{0}/_{00}$. This is 4 per cent of the total dissolved matter in full-strength sea water, although of course the ionic composition is different. Chloride ion accounted for 250 ppm. These levels are about five times those present in water from the Cam, but are lower than might be expected from the diatom flora present, judging by the work of Petersen. It should be stressed, however, that the water sample was collected from tiny pools still remaining; the salinity of the drying mud surface itself would probably be higher but there was no suitable method of sampling it.

The February sample showed a quite different species composition but, even after a wet winter, with the water in the ditch constantly high, the dominant diatom, *Navicula cincta* var. *heufleri*, was a halophilous one.

The April sample showed a further change, with *Navicula viridula* (38 per cent) the most frequent. This species is classed as indifferent but the mesohalobous and halophilous forms, although only occurring in small numbers, together accounted for 50 per cent of the total (the remaining 12 per cent being indifferent). In June the ditch again dried out. Examination when the average depth of water in the hollows was 2 cm showed that *Nitzschia tryblionella* was once more preponderant and, four days later, when the last of the water had evaporated, it was still dominant in the brown coating of the mud surface. It appears that the salt-loving species are probably always present but become prevalent only when the salinity increases.

Salt-tolerant species such as *Nitzschia tryblionella*, *N. sigma*, *Surirella ovalis* and *Amphiprora paludosa* are found regularly in small numbers in ditches around Cambridge and would be expected to become more prominent where favoured by an increase in salinity. A search was made for another habitat where such an increase might be produced by evaporation and the consequent concentration of slightly polluted water. A likely candidate was a shallow saucer-like pond on Stourbridge Common, Cambridge (Nat Grid TL/474 600). The diatom flora indicated a somewhat saline habitat but one less so that the Coe Fen ditch. The dominant species, *Navicula accomoda*, is classed as indifferent by Petersen, although it has been reported to favour slightly polluted water (Hustedt, 1960–66; Schoemann and Archibald, 1977). The salt-tolerant element was conspicuous, however, with mesohalobous and halophilous species (*Nitzschia hungarica*, *N. tryblionella*, *Navicula pygmaea* and others) making up almost half the population (48 per cent).

An attempt was made to grow some of the diatoms in media made up with various concentrations of sea water. Drops of diatom suspension from Coe Fen were added to flasks containing solutions with O, 50 and 100 per cent sea water respectively, made by mixing together appropriate volumes of a fresh water and a sea water culture medium ('E' + 'S' and 'Erd Schreiber' media — see George, 1976). The flasks were then placed under a fluorescent lamp at approximately 25°C.

Growth was poor in the fresh water medium, which even after seventeen days produced only a sparse population of *Nitzschia palea* with a few individuals of *Navicula pygmaea* and *Surirella ovata*. By contrast, after seven days the culture in medium containing 50 per cent sea water was noticeably brown, with a rich growth of the following species, all well represented: *Achnanthes lanceolata, Amphora montana, Anomoeoneis sphaerophora, Gyrosigma attenuatum*, *Navicula cryptocephala*, *N. monoculata*, *N. permitis*, *N. pygmaea*, *N. viridula*, *Nitzschia capitellata*, *N. communis*, *N. hungarica*, *N. palea* and its variety *levidensis*, *Pinnularia microstauron*, *Surirella ovalis*, and *S. ovata*. In addition, there were a few delicate collapsed thin frustules of what was apparently *Leptocylindrus danicus* Cleve, its presence in this most unlikely situation being a complete mystery.

With 100 per cent sea water in the medium, growth was intermediate between the 50 per cent and 0 per cent concentrations. The culture did not become appreciably brown until fourteen days from the start of the experiment, when it contained *Navicula cryptocephala* and *Nitzschia communis* as dominants. Also present were a few cells of *Navicula pygmaea*, *Nitzschia palea*, *N. tryblionella* var. *levidensis*, and *N. hungarica*.

Encouraged by these experiments an attempt was made to isolate some of the species by spreading a suspension of Coe Fen diatoms on Petri dishes of 50 per cent sea water medium as above with 2 per cent agar. Numerous cells grew and healthy unialgal cultures of a number of species were obtained. These are marked by asterisks in the following list of all diatoms found in the Coe Fen samples:

Achnanthes affinis Grun., *A. clevei* Grun., *A. lanceolata* Bréb.*
Amphiprora paludosa W. Smith
Amphora ovalis (Kütz.) var. *pediculus* Kütz., *A. montana* Krasske*
Anomoeoneis sphaerophora (Kütz.) Pfitzner*
Caloneis amphisbaena (Bory) Cleve
Cocconeis pediculus Ehr., *C. placentula* Ehr.
Cyclotella kuetzingiana Thwaites, *C. meneghiniana* Kütz.*
Cylindrotheca gracilis (Bréb.) Grun.
Cymatopleura solea (Bréb.) W. Smith
Cymbella cuspidata Kütz.
Diatoma vulgare Bory
Frustulia vulgaris Thwaites
Gomphonema parvulum Kütz.
Gyrosigma acuminatum (Kütz.) Rabh., *G. attenuatum* (Kütz.) Rabh.
Hantzschia amphioxys (Ehr.) Grun.
Melosira varians C.A.Ag.
Navicula accomoda Hustedt, *N. cincta* (Ehr.) Kütz. var. *heufleri* Grun., *N. cryptocephala* Kütz.,* *N. cuspidata* Kütz., *N. cuspidata* var. *ambigua* (Ehr.) Cleve, *N. dicephala* (Ehr.) W. Smith, *N. fritschii* Lund,* *N. gracilis* Ehr., *N. graciloides* A. Mayer, *N. gregaria* Donkin, *N. halophila* (Grun.) Cleve, *N. hungarica* Grun., *N. insociabilis* Krasske, *N. menisculus* Schumann, *N. minima* Grun. var. *atomoides* (Grun.) Cleve,* *N. monoculata* Hustedt,* *N. mutica* Kütz., *N. permitis* Hustedt, *N. pupula* Kütz., *N. pygmaea* Kütz.,* *N. rhynchocephala* Kütz., *N. salinarum* Grun., *N. twymanniana* Archibald, *N. viridula* Kütz.
Neidium affine (Ehr.) Cleve var. *amphirhynchus* (Ehr.) Cleve
Nitzschia amphibia Grun., *N. capitella* Hustedt, *N. communis* Rabh.,* *N. commutata* Grun., *N. frustulium* Kütz. var. *perpusilla* (Rabh.) Grun., *N. hungarica* Grun., *N. linearis* W. Smith, *N. microcephala* Grun., *N. palea* (Kütz.) W. Smith,* *N. recta* Hantzsch, *N. sigma* (Kütz.) W. Smith, *N. sigmoidea* (Ehr.) W. Smith, *N. tryblionella* Hantzsch, *N. tryblionella* var. *levidensis* (W. Smith) Grun.*
Pinnularia microstauron (Ehr.) Cleve,* *P. viridis* (Nitzsch) Ehr.
Rhoicosphenia curvata (Kütz.) Grun.
Rhopalodia musculus (Kütz.) O. Müll.
Stauroneis smithii Grun.
Surirella angusta Kütz. (?), *S. ovalis* Bréb.,* *S. ovata* Kütz.
Synedra parasitica W. Smith

Notes on Species of Particular Interest

For examples of British records of these, see Whitton *et al* (1978) unless otherwise indicated.

Amphiprora paludosa W. Smith

Occasional in the Coe Fen samples and in ditches around Cambridge. Regarded by Petersen as mesohalobous, it is common in Britain in brackish coastal habitats but is sometimes recorded from fresh water.

Amphora montana Krasske

A tiny species occasional in Coe Fen and isolated into culture from there, using a medium with half sea water. It is not included by Hustedt (1930), Petersen (1943), or Whitton, *et al*, although Lund (1946) found it to be a common diatom of soil. We have not seen it in samples from local soils.

Anomoeoneis sphaerophora (Kütz.) Pfitzer

Common in the Coe Fen ditch and isolated and grown in medium with half strength sea water. Regarded by Petersen as halophilous, it has been recorded occasionally from this country, usually in brackish waters but also from calcareous rivers.

Caloneis amphisbaena (Bory) Cleve

Conspicuous in the Coe Fen samples and in the benthos of the Cam. It was not assessed by Petersen but British records suggest that here it occurs mainly in calcareous waters.

Cylindrotheca gracilis (Bréb.) Grun.

Common in Coe Fen, also in the pond on Stourbridge Common, and seen occasionally in the benthos of the Cam. Although abundant enough, it does not appear in Table 1 because the frustule is so delicate that it is often distorted out of recognition during cleaning and mounting. It is best recognized alive by its shape and by the characteristic rotary movement due to the screw form of the raphe. Petersen did not record it but Hustedt (1930) says that it is found particularly in brackish water. Rarely seen, it is not included in Whitton *et al* but Scourfield (1943) gave an interesting account, with records from five bomb-crater pools in Epping Forest. Perhaps in this case salts accumulated in the water of the clay-lined pools as we suspect they do on Coe Fen.

Navicula cuspidata Kütz. and var. *ambigua* (Ehr.) Cleve

Common in the Coe Fen ditch. Assessed by Petersen as indifferent, it is fairly common in fresh water in Britain. Three cells of this species were found to have the markings of the variety *ambigua* on one valve and of the variety *heribaudii* on the other, confirming a connection between these which was suspected by Hustedt (1961–66). Bastow (1949) made a similar observation.

Navicula pygmaea Kütz.

Sub-dominant in the Coe Fen samples in November and common in later samples from there and from the Stourbridge Common pond. Otherwise it has been met with sporadically, as individual cells, in the Cam. *N. pygmaea* is well known as an alga of brackish water and is also found occasionally in calcareous rivers in this country (eg Peabody and Whitton, 1968). It was isolated and grew well with 50 per cent sea water.

Nitzschia hungarica Grun.

Common in the Coe Fen samples and in the Cam. Regarded by Petersen as mesohalobous. Not included in Whitton *et al* but has been found occasionally in calcareous rivers (eg Peabody and Whitton, 1968).

Nitzschia sigma W. Smith

Occasional in Coe Fen and in ditches around Cambridge. In this country it is commonly found in estuaries and less frequently in calcareous rivers (eg Peabody and Whitton, 1968). Not included by Whitton *et al*.

Nitzschia tryblionella Hantzsch

This species was dominant in all the November samples and is frequent as single cells in the Cam and in pools and ditches near Cambridge. Petersen did not observe it and Foged (1977) regarded it as mesohalobous. Common in brackish water but with occasional records from fresh water in Britain (eg Woodhead and Tweed, 1938). Not included in Whitton *et al*. The species grew well on agar but could not be isolated into unialgal

culture. The variety *levidensis* (W. Smith) Grun was also present in Coe Fen samples and was isolated successfully and grew well with 50 per cent sea water medium.

Surirella ovalis Bréb.

Common in the Coe Fen samples and also frequent in ponds and ditches near Cambridge. Not recorded by Petersen; regarded as characteristic of brackish water by Kolbe (1927) and Hustedt (1930). It was isolated and grew well in the 50 per cent sea water medium.

Discussion

Although many inland saline habitats of northern Europe have been investigated for diatoms, little is known of the algae of such water bodies in England. Round (1960) studied the salt spring in Borrowdale, Cumbria. This had more than half the salinity of sea water but did not show a characteristic diatom flora like that of Coe Fen. Round also mentioned saline ditches near Droitwich, Worcestershire, where *Bacillaria paradoxa* and *Surirella gemma* (typical estuarine forms) were found, but no further details were given.

The saline habitats which have been described in this country can be classed into three types according to the origin of the dissolved salts. Firstly, those whose high salt concentration derives from geological saline strata, as with the salt spring and ditches mentioned above; secondly, those fed by saline industrial effluent, eg the lagoons in Yorkshire described by Fryer (1978); and, thirdly, water bodies near the coast, which receive periodic incursions of sea water, such as Hickling Broad, Norfolk (Gurney, 1965). Small areas of water like the ditch on Coe Fen would appear to constitute a fourth type, where the salt content is derived mainly from animals (in this case ducks and cows). The clay bottom of this ditch ensures that in dry weather the concentration of the salts in the water increases steadily due to evaporation, thus favouring the growth of species of diatoms (and possibly of other organisms) tolerant of a relatively high salinity. Such intermittently saline habitats may well be found commonly in the countryside wherever there is a suitable combination of clay soil, poor drainage, lack of disturbance and the presence of animals. It would be worth while investigating any suitable-looking ponds or ditches in the later stages of drying up.

Similar microhabitats where salts accumulate sometimes occur at the bases of walls and rocks and these conditions are known to encourage the growth of the salt-loving red alga *Porphyridium cruentum*, which in culture also benefits by the addition of sea water (Pringsheim and Pringsheim, 1949).

For the development of populations of halophytic diatoms, individuals are needed to form an inoculum. The salt-loving (or tolerating?) species which multiplied in the Coe Fen ditch are met with sporadically in the Cam and Great Ouse river systems and probably occur in many other base-rich water bodies in Britain.

Some of the smaller species recorded from Coe Fen are common and widely distributed soil algae, for instance *Amphora montana*, *Navicula cryptocephala*, *N. fritschii*, *N. minima*, and *Nitzschia palea* (Lund, 1946). As mentioned above, these species were all readily isolated from the November samples and grew well in a medium containing half sea water. This raises the interesting points as to whether high salt concentrations sometimes develop round particles of drying soil and whether this may select for a degree of tolerance in soil diatoms, which (as with all diatoms) do not have cysts or resistant zygotes to survive unfavourable conditions. The whitened areas on the sides of clay pots containing 'pot-bound' plants probably indicate such a localized accumulation of salts.

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BOOK REVIEWS

The Illustrated Origin of Species by **Charles Darwin**, abridged and introduced by **Richard E. Leakey**. Pp. 240, including text illustrations (plates and line drawings) in monochrome and colour. Faber & Faber. 1979. £8.95

The recent spate of new books on Darwin continues, and it is not surprising to see his most famous work presented in a form suitable for a wider readership. The original publication, still on many recommended reading lists in schools, proves heavy-going for many. Richard Leakey's informative introduction and his imaginative use throughout an abridged text of illustrations and detailed annotations of more modern discoveries and thinking in evolutionary biology make this both an attractive and thoroughly readable version of one of the most important books ever published. Both author and publishers are to be congratulated.

Darwin and the Mysterious Mr. X by **Loren Eiseley**. Pp. xiv + 278, plus 12 pages of monochrome plates. J. M. Dent. 1979. £6.95

Edward Blyth (1810–1873), 'the mysterious Mr. X', published important zoological papers between 1835 and 1837 which show him to be a progenitor of the theorists on natural selection. Darwin was known to be familiar with these publications and according to Loren Eiseley would have used them as a source for his *Origin of Species* published more than twenty years later. Eiseley clarifies not only Darwin's debt to Blyth but also to Alfred Russel Wallace and Charles Lyell. The more important of Blyth's published papers and Arthur Crote's memoir/obituary of him are reprinted in full and form a major part of the text. Detailed notes, references and index are also provided.

MRDS

SOME ASPECTS OF FLOCKING BEHAVIOUR IN LAPWINGS DURING THE MOULTING PERIOD

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Abstract

Evidence is presented to suggest that a summer moulting flock of Lapwings *(Vanellus vanellus)* is largely comprised of birds from the local breeding population and the flock spends the majority of its time on the site at rest. Feeding and roosting take place at different sites. Possible reasons for these findings are presented.

Introduction

Several theories have been proposed to account for flocking in birds. Lack (1968) maintained that individuals benefit from increased protection afforded by greater numbers. Wynne-Edwards (1962) suggested that birds flock so that they are able to assess the size of their populations and could thus regulate their subsequent breeding output. Ward and Zahavi (1973) suggested that flocks act as 'information centres' to allow efficient exploitation of irregularly distributed food reserves. Zahavi (1971) suggested that the improvement to the individual's feeding success whilst a member of a flock is probably more important than the greater protection it provides. Murton (1971) has shown that particular classes of Wood-pigeon *(Columba palumbus)* individuals benefit by observing the feeding behaviour of others. He also pointed out that species which feed in flocks have prominent plumage markings. All these authors point out the advantages of flocking, however. Goss-Custard (1976) suggested that feeding in flocks is not always advantageous because at high bird densities disturbance of prey may reduce feeding success.

During a study of the ecology of an upland population of Lapwings in North Yorkshire, in 1977, I made observations on a summering flock with the aim of explaining this activity during the breeding season.

Spencer (1953) stated that at periods of full moon Lapwings roost during the day and move to the feeding areas at night, but that this behaviour does not occur at other stages of the moon. He cited counts of a flock at Witton Flashes, Cheshire, which showed peak numbers around the full moon period, in support of this contention. Spencer also suggests that a summering flock of Lapwings near Burnley was composed of failed breeding adults or post breeders and that adult and fledgeling birds formed separate flocks. I intend to show in this paper that Spencer's suggestion that different age-classes form different flocks is not necessarily always correct.

Study Area

Gouthwaite reservoir, in the Nidd valley, N. Yorkshire (54.07'N 1.48'W) is surrounded by an upland region which supports a fairly high density of about 1.25 prs/ha of breeding Lapwings on most of the available suitable habitat. The distribution of breeding areas is patchy due to variations in the habitat type. The shallow reservoir provides extensive muddy shores during the summer months, which soon become colonized by a variety of low growing vegetation and this area forms the gathering area for the summering flock. The shore is fringed by a narrow *Juncus effusus* marsh which provides a sheltered border.

Methods and Results

Counts were made throughout the day at hourly intervals, on a weekly basis from early May until late June and also at irregular times at more frequent intervals. Fig 1 shows the numbers present throughout the day (from 10.30 to 17.00 hrs BST) and the peak counts throughout the study period are plotted in Fig 2.

Fig 1 shows that peaks always occurred between 15.00 and 17.00 hrs and for reasons of consistency it is these figures which are used in the plot of Fig 2. The patterns illustrate a

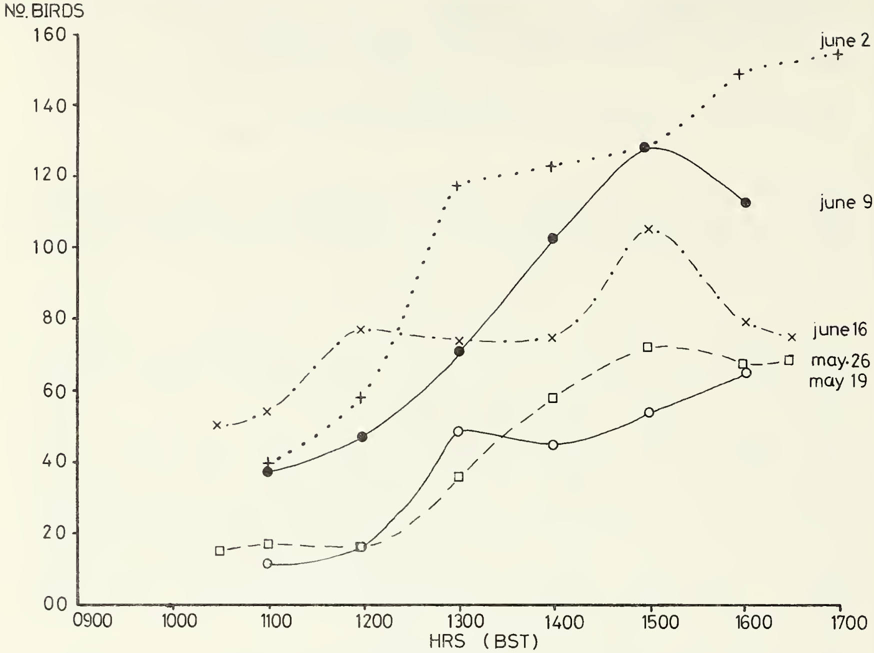

FIGURE 1

Change in flock size during the day. Five dates, May–June 1977

gradual build up in flock size during the day, reaching a peak in the late afternoon and then declining gradually again, together with a fluctuating but gradual increase in the size of the peak count through the season. Fig 2 shows a sharp increase in the numbers present after the full moon, consistent with Spencer's findings. However, observations covered only one full moon period. Counts made between the hours of 06.30 — 10.30 hrs and 17.00 — 22.00 hrs on other dates are consistent with the trends shown by Fig 1.

In order to determine the activities of the flock throughout the day, spot observation techniques were used at half-hourly intervals between 10.30 and 17.00 hrs on the five dates included in Fig 1. Five parameters were used: flying, feeding, resting, preening, and bathing/drinking. The full results expressed as the percentage of the flock engaged in each of the above categories are available from the author. The combined percentages of resting and preening birds appear in Table 1. It is clear from the data that the flock spent most of its time in resting activities, particularly during the afternoon.

Table 1 shows that there is an increase in the percentage of birds resting towards the end of the five-week study period. The difference between the percentages resting throughout the day on the 19 May and the 16 June is statistically significant ($t = 3.8$, $df = 22$, probability level 0.1%). The smaller proportions resting during the first few weeks may have been due to the hot, dry, weather conditions which prevailed until the 3 June. These may have stimulated an increase in the number of birds bathing and drinking. (A few birds were also seen to feed on the two observation days in May.)

Sampling of the mudline (to a depth of 10 cm) where these birds had been seen feeding indicated a very poor invertebrate fauna: Chironomid larvae, Nematodes, small Crustacea, etc, with very few animals exceeding 5 mm in length. This may help to explain why feeding represented a minor activity.

TABLE 1

Spot Observation Results for Preening and Resting Birds

The percentage of flock in combined activities of
preening and resting to show changes in activity throughout the day

Time	*19/5/77*	*26/5/77*	*Date* *2/6/77*	*9/6/77*	*16/6/77*
11.05	16%	77%	95%	89%	96%
11.30	0	49	88	91	100
12.05	40	50	90	93	100
12.30	50	25	91	97	88
13.05	80	76	69	95.5	87
13.30	44	71	67	92	81
14.05	66	76	93	90	88
14.30	65	77.5	85	82	94
15.05	95	84	88	95	99
15.30	72	80	87	94	93
16.05	73.5	87	87	94	93
16.30	92	76	86	100	97

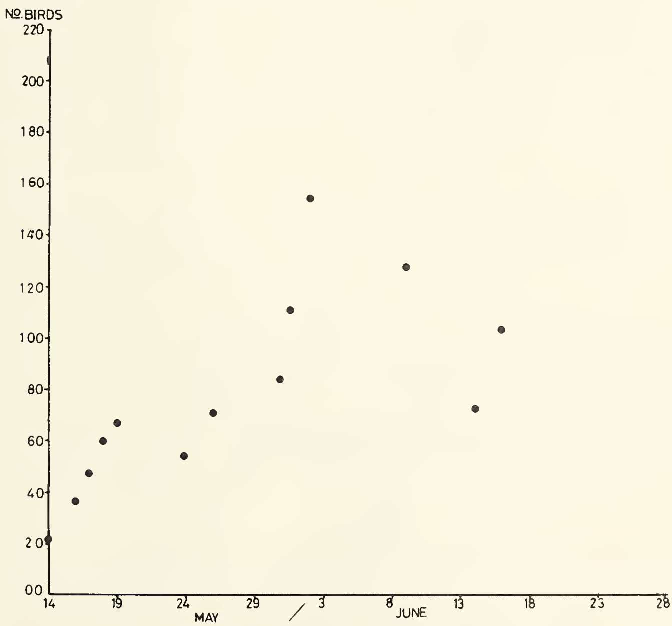

FIGURE 2

Flock size, peak counts 15.00 — 17.00 hrs BST, May–June 1977

DISCUSSION

The evidence from counts and spot observations of the flock indicates that it does not form as a daytime feeding flock. The hourly counts indicate that the flock builds up from low numbers in the early morning, reaches a peak by late afternoon and gradually declines

again. It was not possible to ascertain whether birds rejoined the flock after dark and left at dawn. However, circumstantial evidence suggests that there was not a night roosting flock, so presumably the birds move away from the reservoir at night, probably to feed. Spencer stated that during June and July, Lapwings move onto high ground to feed on the larvae of the Antler Moth *(Charaeas graminis)*. If true for the Gouthwaite flock, the feeding activity must have been concentrated during the early morning, late evening, and maybe at night.

Gouthwaite appears to be used almost exclusively by the birds as a moulting area. The site is open, with low vegetation cover, and has a nearby water supply for bathing and drinking. The flocking behaviour at this site is likely to be in response to increased protection in numbers, in accordance with Lack (1968).

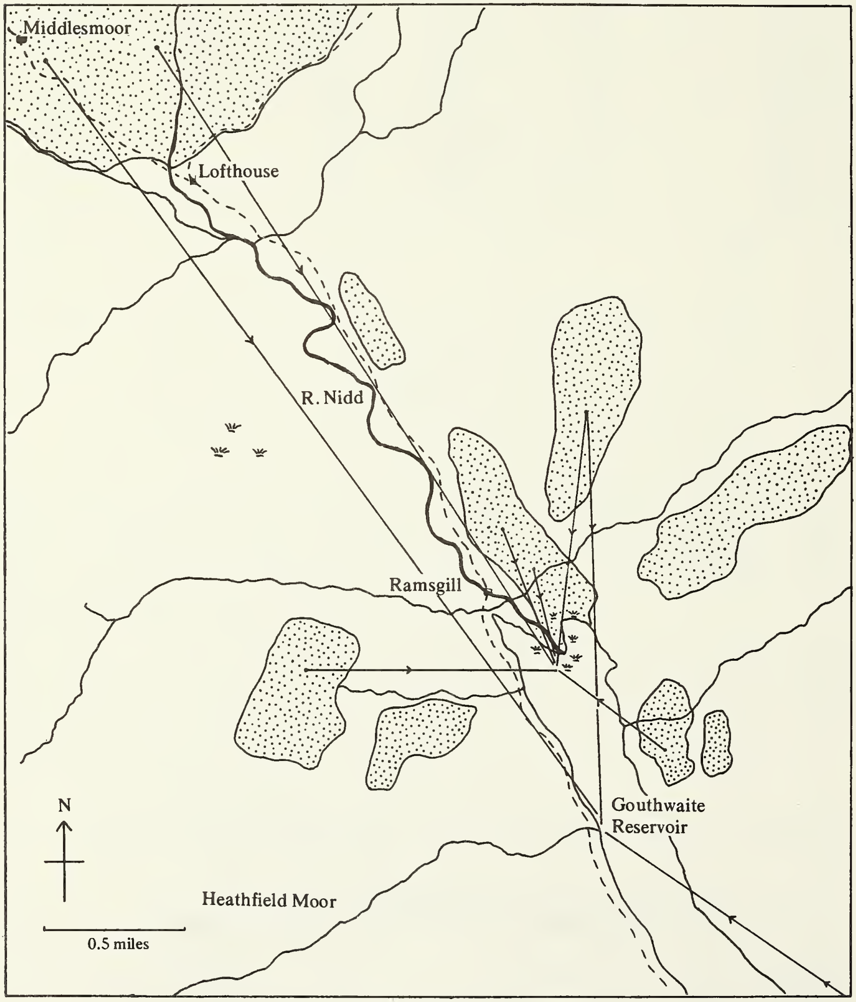

FIGURE 3

Rearing grounds of colour-marked birds seen in the moulting flock

Origin of the Flocking Birds

The gradual increase in the flock size during the season raises the question of where the additional birds come from? As part of a long term project, Lapwing chicks within a 10 km radius of the valley have been individually marked with colour-rings and their rearing site plotted on a map. During the late summer some of these individually marked birds joined the flock. The newly fledged birds did not leave the rearing ground as soon as they could fly but remained on the high ground. They started to filter onto the lower ground to join the moulting flock at the beginning of July and continued to appear throughout the autumn. The presence of these young birds in the flock discounts Spencer's theory that immatures and adults do not mix in one flock. The sightings of colour-marked birds identified the 'catchment area' of the reservoir for Lapwings. Fig. 3 shows the distribution of the chief breeding areas of the species near Gouthwaite and the areas from which chicks have moved to the reservoir. It must be pointed out that these links represent the minimum catchment, although a few birds ringed at more distant sites have not been seen at the study site.

After the end of June the flock consisted of young birds and postbreeders, but what categories of birds formed the flock prior to this period? First-year birds are capable of breeding but by no means all do so (Spencer, 1953). The non-breeding first-year birds are therefore likely to flock early. During the early part of the 1977 breeding season, these non-breeding birds occurred around the breeding sites. At this time of year the vegetation was low and the ground damp and it is likely that the birds were feeding on neutral territories (as described by Spencer) within the breeding areas. As these areas dried out during May, the number of surplus birds on the breeding sites dropped (and the Gouthwaite flock size increased). These birds may have been young birds which had been unsuccessful in claiming territories or acquiring a mate and presumably joined the moulting flock once they abandoned their attempts to breed. Observations also indicated that birds failing during breeding towards the end of the season deserted their sites rapidly. Breeding adult birds were seen to leave the sites which neighboured the reservoir for a short time to join the flock and then return to the nesting area.

Acknowledgements

My thanks are extended to Dr J. C. Coulson who supervised the project, to Dr P. R. Evans for helpful comments on the draft of the paper and to J. Owen and M. Garnett who helped in finding colour marked birds.

Summary

Observations were made on a summering flock of Lapwings during May and June 1977. Details are included of the change in flock size during the day with evidence to suggest that the flock uses the site during the day as a resting site and leaves at night to feed elsewhere. The flock was found to build up erratically during the season and observations of individually marked birds showed that the new arrivals included newly fledged chicks from breeding areas up to 3½ miles away. Post-breeding and failed-breeding adults were also thought to join the moulting flock.

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BOOK REVIEWS

The Naturalised Animals of the British Isles by **Christopher Lever**. Pp. 600. Paladin Books. 1979. Paperback, £2.95

Mr Lever, for what are on the whole sound ecological and conservational reasons, is against the introduction of foreign species, but by including some rather doubtful examples such as the guppy, the midwife toad and the Soay sheep, he has compiled a list of 22 mammals, 22 birds, 1 reptile, 6 amphibians and 13 fish which have become more or less permanent members of the British fauna through human agency. His book, first published in 1977 and now available in paperback, provides a drawing and a distribution map of each of them, and remarkably detailed accounts of their origins and how they came to be established in this country.

FHB

The Royal Parks of London by **Guy Williams**. Pp. 234. Constable. 1978. £6.95

This book provides an enjoyable, mildly instructive account of the nine royal parks which the residents of and visitors to London are privileged to use for their recreation. It provides an outline of the history of each of them, and many anecdotal sidelights of a light-hearted and amusing kind. The text is enlivened by maps and a score or so of photographs.

JSK

A Natural History of Britain and Ireland by **Eric Simms**. Pp. 258. J. M. Dent. 1979. £6.95

A pleasing general account of the wealth of natural history to be found throughout the British Isles by the well-known broadcaster and writer. Each of the fifteen chapters is devoted to a region, ranging from London (as the 'Concrete Desert') to the Scottish uplands (as the 'Bottle-Green Pines'). The content is biased towards mammals and birds, and the task is perhaps too ambitious as can be gauged, for example, from the treatment of Ireland in nineteen pages.

The Observer's Book of Rocks and Minerals by **R.** and **F. Atkinson**. Pp. 184, with 58 colour and 7 black and white photographs and many line illustrations. Warne. 1979. £1.50

A convenient pocket book, which provides a useful introduction to the young student or layman who wants information about the identification and character of rocks and minerals. There is a short but sound introductory section which deals with classes of rock and field methods of identifying minerals. The body of the book deals with seventy-two minerals and fifty-two rock types. Though these are arranged in an unconventional manner, the index enables appropriate sections to be found readily. The illustrations are generally clear though the inclusion of a scale would have improved several of them.

DC

From the Edge of Extinction: Endangered Species in North America by **D. Stewart**. Pp. 191, with 21 line drawings. Frederick Warne. 1979. £6.95

The message of this book is that conservation of endangered species can be successfully accomplished providing that people and governments become sufficiently motivated. A series of twenty-one case histories describes the measures taken to ensure the survival of bison, trumpeter swans, timber wolves, etc. Each chapter is illustrated by a line drawing of the particular animal discussed but those of the mammals are rather uninspiring. The type is large and there are a number of blank pages so that the text is shorter than the page number would suggest; in addition there is no index. Although limited to North American examples the book, which is very readable, would be a valuable addition to school libraries or an interesting evening's reading for the amateur naturalist.

DHSR

TWO LETTERS OF BRYOLOGICAL INTEREST FROM RICHARD SPRUCE TO DAVID MOORE

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Richard Spruce needs little introduction: his achievements as botanist and explorer in the Amazonian and Andean regions in the mid-nineteenth century opened up this part of the world to botanical science.

Spruce was born at Ganthorpe, near Castle Howard on 10 September 1817, and spent most of his life, apart from his travels, in the North Yorkshire villages of Welburn (*vide* letterheads below) and Coneysthorpe. Spruce was educated by his father, and followed him into the teaching profession. He became a teacher of mathematics at the Collegiate School, York, in 1839, where he remained until it closed down in 1844. He devoted his time thereafter to botanical pursuits, and although of delicate health, undertook a collecting excursion to the Pyrénées during 1845–46; in 1849 he embarked on his major travels to South America, where he remained until 1864.

He is best known as a bryologist: research on hepatics occupied most of his life, and his South American collections provided the material for numerous published papers, in particular *Hepaticae Amazonicae et Andinae.* These collections were sent to William Mitten (1819–1906, bryologist) in 1863, but Spruce was dismayed, on his return to England, to find the condition they were in, and remarked in a letter to William Wilson (1799–1871, bryologist) '. . . he [Mitten] has had them in hand nearly two years and a half, and has not yet made up a single set or found a subscriber . . . he has taken the best specimens of everything for himself, and has worked them up in his own herbarium so as to shine on them, no doubt, some day . . . he has quashed all my mss. names, and substituted others of his own . . .' (Sayre, 1975). However, in the spring of 1866, Spruce distributed sets of mosses he had prepared himself; they each bore label titles of 'MUSCI AMAZONICI ET ANDINI . . . Legit RIC.SPRUCE, DET.W. MITTEN'. The sets first sent out were without names but with Mitten's serial numbers; these vary considerably: according to Sayre (1975), the list shows 1462 consecutive numbers with scattered addenda to 1518, and some specimens have duplicates. Later sets have Mitten's determinations which Spruce had published as a catalogue in 1867. The material provided an indispensable source for Mitten's *Musci Austro-americani* published in 1869.

From 1864 until his death at Coneysthorpe on 28 December 1893, Spruce gave help and advice to many bryologists throughout the world, mainly through the lively correspondence he maintained. His letters are notable both for their calligraphy and for their clarity of expression. The two letters transcribed below were recently discovered among the private papers of Major General F. D. Moore in the course of the author's research on his grandfather David Moore (1807–79). David Moore, as Superintendent (and later Curator) of the National Botanic Garden, Glasnevin, Dublin, naturally corresponded with the leading European botanists of the day; included among their number was Richard Spruce. The handwriting and style of these two letters are typical of Spruce's correspondence.

Further biographical details on Richard Spruce are to be found in Stabler (1894), Spruce (1908), Sheppard (1909), Scott (1961), Sledge (1971), and Desmond (1977), and information on David Moore in Praeger (1949), Desmond (1977) and Seaward and Coppins (1980).

The nomenclature of the hepatics quoted in the letters has been revised according to Paton (1965).

Welburn,
York.
15 Sept. 1873.

My dear Sir

I was much obliged for your letter, & for the interesting Descriptive Catalogue of Irish Mosses,[1] which I trust you will soon supplement with a similar Catalogue of the Hepaticae.[2] I should have written sooner to thank you, but that writing, or occupation of any kind, except what I can do when lying on my back, is painful,[3] & I have of late employed my little strength in the study of South American Hepaticae — an almost interminable task — which has almost entirely prevented me from writing letters.[4]

I heard a few days ago from our friend Lindberg.[5] He had enjoyed his visit to Ireland, and especially to Glasnevin, but he says little about his journeyings in your company, except that he visited the Killarney region, & was delighted to gather Lejeunea calyptrifolia[6] and other rarities. What was your route, & what places did you more particularly explore?

In the summer of 1842 I spent nearly 4 weeks with our late friend Dr. Taylor.[7] I was unfortunately ill all the time, & could get about very little, so that I gathered only things near at hand, my farthest excursion being to Cromaglown.[8] I am very desirous to ascertain if any of Dr. Taylor's descendants are in being, and where. He had a son (Joseph) & I think 6 grandsons. Do any of these still live at Dunkerron;[9] and is there now any resident botanist at all in Kerry?

I should be thankful for a scrap, in good state, of such forms of the species of Frullania, Lejeunea & Radula as you may have to spare, as also for a specimen of Anthoceros laevis. But if you cannot spare either the specimens or the time to look then out, then do not trouble about it, for I can offer very little in exchange. When I found my working days were virtually over I gave away my large collection of duplicate Cryptogamia, & it is only by accident that a few British Mosses & Hepatics have been reserved. Such as they are, you are very welcome to any of them.[10]

You ought to have more Sphagna in Ireland than have yet been found[11] — What species preponderate in bogs near Dublin; and do they ever grow with you, (as they do in the North of England,) on ledges of wet rocks, e.g. Sphagnum rubellum,[12] which is a great ornament to rocks in Teesdale?

Believe me
Yours very faithfully

Rich.[d] Spruce.

Welburn, York.
10 March, 1874.

My dear Sir

I ought to have written to you long ago, and even now I cannot write as I w[d]. wish, for I wanted first to examine your Hepaticae & report on them; but my capacity for sedentary occupation has been for months so slight, that all I have done has been to work up a few arrears of my South American Hepaticae. I am much obliged for the fine specimens, & have just looked at them sufficiently to decide that there was not among them (as I hoped there might be) any trace of a Lejeunea, which I suppose new to Europe, that I picked a few stems of among Hepaticae gathered by Dr. Taylor & myself. What I have of it is unfortunately sterile, & I cannot yet satisfy myself if it be a form of the almost cosmopolitan L. cucullata[13] or an undescribed species.

I am sorry you can give me so little information about Dr. Taylor's family. His eldest grandson was a sharp little fellow of 6 or 8, in 1842. I recollect one day when the Doctor & I were deep in Crypts, & discussing the characters of Plagiochila, Mastigobryum, & other groups of the recently-split-up Jungermania, [sic] the little boy was annoyed that we did not play with him, & strutted about the room talking to himself. After a while we noticed that he

was mimicking our discourse, & we burst into a roar of laughter as we heard him muttering "Plaguy ugly!" "Nasty boy, Bryan!" which was his version of the above outlandish names.

I shall look with much interest for your promised Catalogue of Irish Hepaticae. I was often reminded, when gathering mosses on the slopes of the Andes, of the Kerry mountains, whose vegetation — especially cryptogamic — is the nearest approach to that of tropical mountains we have anywhere in Europe. On the volcano Tungmagna, in the Equatorial Andes, some species of Clethra, & even of Thibandia, have often reminded me of the Arbutus. Instead of heaths, there were low bushy Gaultherias. Whortleberries were represented by true Vacciniums. St. John's Worts by true Hypericums. Instead of Broom, there was the very similar Genista Initensis. Then, among Hepaticae, Frullania Hutchinsiae[14] was there, in person. So was Adelanthus decipiens; and Lepidozia cupressina,[15] from which I try in vain to separate Taylor's L. tumidula.[16] Dumortiera hirsuta grew everywhere on shaded rocks, wet & dry, & you know Lindberg says our Irish D. irrigua[17] is not distinct from it, but I have not yet got as far as that genus in my study of the S. American Hepaticae, & cannot say if he be right. Of course the number of species was vastly greater; but the general characters of Andine cryptogamic vegetation is very fairly represented on the mountains of Kerry — far more than in the Alps & Pyrenees.

I am going a second time through the Lejeuneae & allied genera (or subgenera) of my own gathering in S. America. They amount to over 500 forms, & cannot comprise fewer than 200 distinct species. The Frullaniae, too, are a very fine lot — I have plants half-a-yard long, & there are several undescribed species.

I gave away most of my European duplicates long ago, & I fear I have little to offer you. Perhaps I may have fertile Jung. Francisci[18] & a few others, if you care for them.

I wish indeed Dr. Carrington[19] would publish, but (like myself) I fear he is a great invalid.

I am very grateful for the kind letter you have written me, & shall always be glad to hear from or of you, as well as to receive a scrap of any of your additions to the Hepaticology of Ireland.

Believe me
Dear Sir
Very faithfully yours

Richd. Spruce.

NOTES

[1] See Moore (1873).

[2] This was never done, but a 'Report on Irish hepaticae' appeared four years later (Moore, 1877).

[3] Spruce suffered from ill-health for much of his life. He was never robust, and as a young man was considered by some to be consumptive; despite this, he undertook a most arduous exploration of South America during 1849–64. Not surprisingly his health was further impaired; he records for 24 April 1860: 'Woke up this morning paralysed in my back and legs. From that day forth I was never more able to sit straight up or walk about without great pain and discomfort'. Soon after his return to Yorkshire in 1867 his health deteriorated; he writes 'I can hardly write in any other way than reclining in my easy chair with a large book across my knee by way of a table, and consequently I rarely write anything but what is absolutely necessary', and by 1869 he wrote 'I fear I must henceforth shut my eyes to cryptogams; I have packed the microscope away lest I should enter into temptation'. By 1871, however, his condition had improved slightly and he was able to continue his researches. He died following an attack of influenza, which his frail constitution was unable to withstand.

[4] This 'almost interminable task' culminated in the publication of his monumental work, *Hepaticae Amazonicae et Andinae*, in 1884–85. The publication date is variously cited as 1884 or 1885; in actual fact, pages 1–308 were published in April 1884 and pages i–xi and 309–588 in November 1885 (P. W. James, *pers. comm.*).

[5]Sextus O. Lindberg, 1835–89, Professor of Botany, University of Helsinki; he visited Ireland in 1873.

[6]= *Colura calyptrifolia* (Hook.) Dum.

[7]Thomas Taylor, d. 1848, acting Professor of Botany and Natural History, Royal Cork Scientific Institution; responsible for the cryptogamic section of Mackay's *Flora Hibernica* (1836), and co-author, with W. J. Hooker, of *Muscologia Britannica* (1818).

[8]Cromaglown (= Cromaglan), favourite haunt of botanists, 6 miles SW of Killarney, Co. Kerry.

[9]Taylor (see note 7) retired to Dunkerron, near Kenmare, Co. Kerry.

[10]Spruce's major plant collections are now housed at Kew, Manchester Museum, York Museum, and Harvard University.

[11]Nine species only are listed in Moore (1873), pp. 460–3; cf. Smith (1978), pp. 30–78.

[12]= *S. capillifolium* (Ehrh.) Hedw.

[13]Not *L. cucullata* = *Acrolejeunea pycnoclada* (Tayl.) Schiffn. (see Gradstein, 1975, p. 109) a widely distributed species of tropical Africa, Indo-Malesia and the Pacific islands, but *Lejeunea diversiloba* Spruce — see Greig-Smith (1953); Hep. Brit. Exsicc. no. 281 of Carrington and Pearson (1878–90).

[14]= *Jubula hutchinsiae* (Hook.) Dum.

[15]= *L. pinnata* (Hook.) Dum.

[16]Now included within *L. pinnata*.

[17]Now included within *D. hirsuta* (Swartz) Nees.

[18]= *Cladopdiella francisci* (Hook.) Buch.

[19]Benjamin Carrington, 1827–93, medical practitioner and co-author, with L. C. Miall, of *Flora of the West Riding* (1862); he specialized in hepatics and was the author of *British Hepaticae* (commenced 1874 — incomplete) and also compiled a published exsiccata, *Hepaticae Britannicae* (1878–90), which was added to by W. H. Pearson (see Sayre, 1971, p. 189.

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WILLIAM SUTCLIFFE OF HEPTONSTALL AND HIS COLLECTION OF BRITISH AND IRISH MOSSES

T. L. BLOCKEEL

John Nowell of Todmorden, though rightly celebrated for his bryological achievements against a background of hardship and poverty, was nevertheless only one of several enthusiastic botanists active in Calderdale in the early and middle years of the nineteenth century. Many of his famous discoveries were made in the company of friends and colleagues (cf Cash (1883) on the finding of *Cinclidium stygium*). One such friend was Abraham Stansfield, and he and Nowell were leading lights in the formation of the Todmorden Botanical Society in 1852 (cf Crump and Crossland, 1904). It was at a meeting of the Society on 19 March 1866 that Nowell as vice-president read a paper entitled 'Notes on some rare mosses at Todmorden', and illustrated it with beautifully mounted specimens (Nowell, 1866). The causes of the disappearance of 'these beautiful plants' stimulated a discussion to which many members contributed, including Nowell himself, T. Stansfield, W. Patman and W. Sutcliffe.

William M. Sutcliffe would be nothing more than a name to us but for the survival of his bryophyte collection, now housed at the Bankfield Museum, Halifax. A few scraps of biographical information may be gleaned from the papers used in packeting the specimens. Two sheets, dated 1827 and 1829 respectively, are examples of Sutcliffe's own 'penmanship' as a pupil at Heptonstall School. He appears indeed to have lived at Heptonstall throughout his life: one packet is the front page of the *Leeds Mercury* (8 September 1858) addressed to Sutcliffe at Heptonstall. Other packets offer good evidence that he was involved with the school as an adult, presumably as a teacher. Many packets are formed from children's exercise books (dated 1856–61), including that of a Henry Nowell. Some localities refer to 'school land' or 'school land lane', and a gathering of *Bartramia pomiformis* is labelled 'Gibson Wood and Lee Wood, class H, 22 Feb 60'. Perhaps it was collected on a nature ramble!

The collection bears evidence of collaboration between the Calderdale botanists. Some specimens were passed to Sutcliffe by Nowell, including some sent to Nowell by his correspondents in other parts of the country (eg H. Boswell and W. Curnow). Two packets bear the initials of W. Patman, one of the members present at the Todmorden Botanical Society meeting referred to above. A third packet, evidently sent for identification, has the message 'Mr. Patman will bring name'. In fact many packets carry annotations which indicate that they were sent for naming or checking, presumably to Nowell. The names are almost invariably correct and testify to the reliability and accuracy of Nowell's work.

Most of the packets are dated between 1856 and 1863. They indicate that Sutcliffe visited the Lake District in July 1859, Ireland in July 1860, and Wales in September 1860.

THE COLLECTION

There are a little over 500 packets in the herbarium. Less than half of these are from Calderdale, the remainder originating from other parts of Yorkshire and Lancashire, with a substantial number from Wales, Ireland and Cumbria, with a few from Cheshire, Oxfordshire, Cornwall, Derbyshire, Ayrshire, and the Isle of Man. The remaining packets either have no locality, or the locality has not been deciphered or traced with accuracy.

The identity of the collector is not always certain, even where there is a name on the packet. Thus, Nowell's name is on a packet of *Pterygoneurum ovatum* from Oxford which was almost certainly gathered and sent by Boswell. Nowell is nevertheless represented by a number of gatherings from various parts of Yorkshire and Lancashire, with a few from his excursions to North Wales and Pontefract. His packets are neatly folded from plain paper, in contrast to Sutcliffe's, which are formed from newspapers, school-books and other scraps. Many packets, of both types, bear the initial S. I do not know the significance of this abbreviation, but it is improbable that it refers to Sutcliffe, whose name is usually written as WS.

Other collectors are represented by only a very few packets. They are H. Boswell (Oxford), W. Curnow (Cornwall), W. Patman (Todmorden), and Dr J. B. Wood (Pontefract).

I have examined all packets in the herbarium but the systematic list includes only the more important.

CALDERDALE (VC 59 AND 63)

There are over 200 packets. Two taxa are new to VC 63, one is confirmed for VC 59, and there are some important additions to Calderdale as well as vouchers for extinct or rare species.

Pogonatum nanum: Horsebridge Clough (VC 63), WS, 28/11/1859.
Polytrichum commune var. *perigoniale:* Widdop Gate (new to VC 63), 2/6/1860.
Fissidens exilis: banks, Harleywood, Todmorden (VC 63), –/2/1864.
F. incurvus: banks, Harleywood, Todmorden (VC 63), —/2/1864.
F. pusillus: wet rock, Hebden (VC 63), WS, 4/8/1860 (This is *F. pusillus* sensu Bruggeman-Nannenga, but would come under *F. viridulus* sensu A. J. E. Smith.)
Pleuridium subulatum: fallow field, Heptonstall (VC 63), 19/3/1862.
Distichium capillaceum: wet scar, Eaves Bottom (VC 63), 14/2/1863.
Seligeria donniana: shady rocks, Highgreenwood (VC 63), –/9/1855; wet rock, Eaves Bottom (VC 63), 7/8/1860.
Dicranella secunda: bank near Gibson Mill (VC 63), –/11/1854.
Dicranum fuscescens: rocks, Highgreenwood (VC 63), –/9/1848.
Gymnostomum aeruginosum: Ramsden Clough (VC 59), two packets, 30/9/1854 and –/10/1860.
Weissia microstoma: fallow field, White Hill Nook (VC 63), –/5/1863.
Ptychomitrium polyphyllum: wall, Greetland (VC 63), –/6/1862.
Splachnum sphaericum: Stansfield Moor (VC 63), 30/6/1862.
Schistostega pennata: Thieveley Scouts (VC 59), W Patman, –/5/1863.
Tetrodontium brownianum: dripping rock, Hebden (VC 63), WS, 24/11/1860; rocks, Gorple Clough (VC 63), WS, 2/6/1860.
Pohlia elongata sensu stricto: Rattan Clough (confirmed for VC 59), –/7/1857.
Mnium stellare: Dulesgate (VC 59), J Nowell, –/8/1860.
M. marginatum: Sheddin (VC 59), 4/5/1861.
Plagiomnium elatum: wet spring, Widdop (VC 63), 30/5/1863; wet bog among rushes, Widdop Clough (VC 63), 3/6/1860; bog, Sheddin, (VC 59), WS, 4/5/1861.
Rhizonmium pseudopunctatum: bog, Sheddin (VC 59), WS, 4/5/1861; ditto, 3/3/1862.
Amblyodon dealbatus: Stansfield Moor (VC 63), S, –/6/1857.
Bartramia pomiformis: rock, Gibson Wood and Lee Wood (VC 63), class H, 22/2/1860; wall, Lee Wood (VC 63), –/5/1860.
Philonotis calcarea: Sheddin (VC 59), 4/5/1861.
Amphidium mougeotii: Cragg Vale and Hebden (VC 63), 3/4/1862 and 5/4/1862.

Hookeria lucens: Gibson Wood (VC 63), 22/2/1860.
Fontinalis squamosa: Hebden (VC 63), 19/5/1860.
Leskea polycarpa (among *Brachythecium populeum*): rock, Gibson Wood (VC 63), −/7/1860.
Platydictya jungermannioides: shady rocks, Sheddin (VC 59), −/−/1851.
Hygrohypnum ochraceum: wet rocks, Hebden and Gorple Clough (VC 63), 30/5/1863.
Calliergon giganteum: in wet swamps, Kant Clough (VC 59), Sutcliffe, −/11/1860; Sheddin (VC 59), WS, 4/5/1861.
Orthothecium intricatum: clefts of rock, Dill Scout (VC 63), −/11/1859.
Isopterygium pulchellum: Dulesgate (VC 59), −/9/1855; wet shale, Hardcastle (VC 63), WS, 19/9/1861; Gibson Wood (VC 63), 29/2/1860.
Plagiothecium latebricola: roots of decayed oaks, Harleywood (VC 63), no date.
Hypnum mammillatum: Highgreenwood (new to VC 63), 27/9/1859; damp rock, Lower Hebden Wood (VC 63), 16/2/1860; + two further packets from the Hebden Valley.

Yorkshire, Excluding Calderdale (VC 63, 64 and 65)

Fissidens minutulus: banks near Pontefract (VC 63), −/12/1863. This is *F. minutulus* sensu Bruggeman-Nannenga, but would come under *F. viridulus* sensu A. J. E. Smith.
Distichium capillaceum: Teesdale (VC 65 or 66), −/8/1855; Bolton Woods, Strid (VC 64), Good Friday 1862; banks of the Dee near Dent (VC 65), S, 5/6/1861.
Dichodontium flavescens cfr: Bolton Woods (VC 64), S, −/5/1858.
Aloina rigida: wall, York Road, Leeds (VC 64), 18/11/1860.
Gymnostomum recurvirostre: moist shady rocks by River Dee near Dent (VC 65), S, 5/6/1861.
Mnium marginatum: Bolton Woods (VC 64), Good Friday 1862.
Plagiopus oederi: Deepdale near Dent (VC 65), 2/6/1861.
Orthotrichum cupulatum var *riparium:* stones, the Hodder (VC 64 or possibly 60), S, −/4/1860. Perhaps collected by Dr Wood (cf Braithwaite (1888–95) p 78).
O. stramineum: on ash trees, vale of Dent (VC 65), S, 3/6/1861.
Neckera pumila: Bolton Woods (VC 64), S, −/4/1858.
Myrinia pulvinata: on old willows near York (VC 61, 62 or 64), S, −/8/1851.
Myurella julacea: limestone rocks, Ingleborough (VC 64), S, 1/6/1861.
Scorpidium scorpioides: nr Malham Tarn (VC 64), −/6/1856.
Hygrophypnum eugyrium: Cautley Waterfall near Sedbergh (VC 65), S, 4/6/1861.
H. dilatatum: Cautley Waterfall near Sedbergh (VC 65), S, 4/6/1861.
Rhynchostegiella teesdalei: rocks in a small stream near the Hodder (VC 64 or possibly 60), 19/4/1862.
Orthothecium intricatum: shady rocks near Malham (VC 64), S.
O. rufescens: three packets from head of Gordale (VC 64), 1850 and 1856.
Entodon concinnus: rocky banks near Malham (VC 64), two packets, −/−/1856 and −/9/1859.
Taxiphyllum wissgrillii: rocks by banks of the Hodder (VC 64 or possibly 60), 19/4/1862.
Pylaisia polyantha: on thorns, Broughton Hall near Skipton (VC 63), S, −/4/1858. There are thirty-eight additional packets not listed here.

Lancashire, Excluding Calderdale, and Cheshire (VC 59 and 58)

Dicranum undulatum: two packets from Wybunbury Bog (VC 58), S, −/6/1855.
Orthodontium gracile: new red sandstone rock, Alderley Edge (VC 58), 30/3/1861.
Bryum warneum: Southport (VC 59), J. Nowell, −/9/1860.
B. calophyllum: Southport (VC 59), J. Nowell, −/9/1860.
B. knowltonii: Southport (VC 59), J. Nowell, −/9/1860.
Meesia uliginosa: sandhills near Southport (VC 59), S, −/5/1858.
Catoscopium nigritum: among sandhills near Southport (VC 59), S, −/9/1858.
Philonotis caespitosa: Walton (VC 59), J. Nowell, −/9/1860.
Drepanocladus vernicosus: Wybunbury Bog (VC 58), J. Nowell, −/9/1860.

D. lycopodioides: near Southport (VC 59), S, –/6/1859.
Calliergon giganteum: Wybunbury Bog (VC 58), J. Nowell, –/9/1860.
There are thirteen additional packets not listed here.

CUMBRIA (VC 69 AND 70)

Splachnum ampullaceum: bog near Kendal Fell, Staveley (VC 69), 4/7/1859.
Bartramia halleriana: Westmorland (VC 69), –/7/1859.
Hedwigia ciliata: Staveley (VC 69), WS, two packets, 4/7/1859.
Leptodon smithii: Cumberland (VC 70), –/7/1859. Probably from the Borrowdale site (there are Borrowdale gatherings of *Racomitrium aquaticum* and *Isothecium myosuroides* in the collection).
Leucodon sciuroides: Staveley (VC 69), WS, –/7/1859.
Rhytidium rugosum: Arnside (VC 69), WS, 11/7/1859.
There are twenty-six additional packets not listed here.

NORTH WALES (VC 49)

Diphyscium foliosum: bank, pass of Llanberis (VC 49), –/7/1852; bank of river below the waterfall, Aber (VC 49), S, 15/9/1860.
Cynodontium bruntonii: rocks, Aber (VC 49), S, 21/5/1861.
Encalypta vulgaris: Conway Castle (VC 49), 6/9/1860.
Aloina aloides var. *ambigua:* Ormeshead (VC 49), 4/9/1860.
Bryum radiculosum: mortared walls, Bangor and Aber (VC 49), 24/5/1863.
Orthotrichum striatum: woods near Trefriw (VC 49), S, 14/9/1860; tree, Llanberis (VC 49), 8/9/1860.
O. tenellum: on trees near Aber waterfall (VC 49), S, 21/5/1861.
Pterogonium gracile: rock near Dolbadarn Castle (VC 49), 5/8/1856.
Hygrohypnum eugyrium: stones in the watercourse, Aber (VC 49), JN, two packets, 24/5/1863.
H. dilatatum: near Aber (VC 49), –/5/1863.
There are thirty-eight additional packets not listed here.

OXFORD (VC 23)

All packets presumably sent by H Boswell, though three bear Nowell's name.
Pogonatum nanum: Bagley Wood near Oxford (VC 23), H. Boswell, –/11/1861: Oxford (VC 23), Nowell, –/11/1860 and –/1/1861.
Pterygoneurum ovatum: Oxford (VC 23), Nowell, recd 7/1/1861.
P. lamellatum: nr Oxford (VC 23), H. Boswell, –/2/1860.
Barbula hornschuchiana: near Oxford (VC 23), Boswell, –/–/1860.
Gyroweisia tenuis: Blenheim Park (VC 23), H. Boswell, 19/7/1861.
There are five additional packets not listed here.

DERBYSHIRE (VC 57)

Two packets only: *Tortula subulata* and *Grimmia pulvinata* from Buxton, 16/7/1860.

ISLE OF MAN (VC 71)

Schistidium maritimum: Isle of Man, Dr Wood, –/9/1859.

CORNWALL (VC 1)

Three packets from Penzance, sent by Curnow: *Schistidium maritimum,* –/3/1862; *Epipterygium tozeri,* –/10/1861; *Eurhynchium speciosum,* –/10/1861.

AYRSHIRE (VC 75)

Two packets: *Orthotrichum rivulare* and *O. pulchellum*, from near Dailly, S, –/5/1860.

CONNEMARA, IRELAND (VC H16)

Metzgeria fruticulosa sensu stricto: intermixed with *Cryphaea* in the packet from Oughterard (new to VC H16).

Pleurozia purpurea: mountains of Connemara (VC H16), 18/7/1860.

Andreaea alpina: mountains of Connemana (VC H16), WS, –/7/1860.

Aloina aloides var. *aloides:* Connemara (VC H16), WS, –/7/1860.

Funaria obtusa: Connemara (VC H16), WS, –/7/1860.

Zygodon conoideus: trees near Oughterard, Connemara (VC H16), S, 20/7/1860.

Ulota phyllantha: near Clifden Castle, Connemara (VC H16), S, 19/7/1860.

U hutchsinsiae: rocks, Connemara (VC H16), WS, two packets, 18/7/1860.

Hedwigia ciliata: rocks, Connemara (VC H16), WS, two packets, 18/7/1860.

Cryphaea heteromalla: on trees near Oughterard (VC H16), S, –/7/1860.

Calliergon sarmentosum: wet rocks, Connemara (VC H16), S, –/7/1860.

There are nine additional packets not listed here.

LOCALITY UNTRACED OR NOT STATED

There are almost 100 such packets. They include a substantial number bearing the name Hanson (or H) or ?Labzey (L, La), but usually no other information. I have been unable to identify these two names. No point is served in listing these unlocalized packets, but there are a few others where the locality is stated but has not been traced with certainty. Most involve common species; three have been located tentatively.

Polytrichum alpinum: Blackdain, 2/7/1860. This is probably Blake Dean (34/9531) or Black Clough (34/9733) in the Alcomden area north of Hebden Bridge (VC 63).

Orthotrichum affine: tree, Earlees Wood, WS, 25/7/1859. This may be Ealees Wood, Littleborough (34/9416, VC 59).

Neckera crispa: Earlees, WS, 25/7/1859.

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BOOK REVIEWS

A Recorder's Log Book or Label List of British Butterflies and Moths by **J. D. Bradley** and **D. S. Fletcher**. Curwen Books. 1979. £2

Lepidopterists will welcome this publication which is complementary to the series of volumes of 'The Moths and Butterflies of Great Britain and Ireland'. It provides a cheap and readily available version of the 1972 Kloet and Hincks check list and it can be used as a field record book, as a means of submitting records to the Biological Records Centre, or as a label list. Although printed on both sides of the paper the carefully thought out design is such that by cutting the pages in half the printed list is on each half.

Compilers and publishers are to be congratulated on providing lepidopterists with a very useful addition to their library.

RC

British Ascophoran Bryozoans by **P. J. Hayward** and **J. S. Ryland**. Pp. vi + 312, including 129 figures. £6.80; **British Coastal Shrimps and Prawns** by **G. Smaldon**. Pp. vi + 126, including 51 figures. £4.50; **British Nearshore Foraminiferids** by **John W. Murray**. Pp. vi + 68, including 22 figures and frontispiece. £2.80. Linnean Society of London/Academic Press. 1979.
Numbers 14, 15 and 16 in the impotant new series of Synopses of the British Fauna, containing valuable introductory matter, keys, descriptions, bibliographic references, etc. Most detailed and useful monographs of British taxa.

A Key to the British Freshwater Leeches by **J. M. Elliott** and **K. H. Mann**. Pp. 72, including 1 coloured plate and 52 figures. 1979. £2; **A Guide to Methods for Estimating Microbial Numbers and Biomass in Fresh Water** by **J. G. Jones**. Pp. 112, including 6 figures and 4 tables. 1979. £2.50. Both published by Freshwater Biological Association, The Ferry House, Ambleside, Cumbria LA 22 0LP.
British Freshwater Leeches (first published 1954; 2nd edition 1964) is a greatly revised and enlarged new publication rather than just a third edition of the original key. Since the previous edition, one new species has been added to the British list, more information has become available on leech natural history, and a considerable number of publications have extended the bibliography.
Microbial Numbers and Biomass will provide a most valuable practical guide and a reference source for the freshwater ecologist.

The Observer's Book of Caterpillars by **David J. Carter**. Pp 159, with 32 coloured plates and 17 figures in the text. Warne. 1979. £1.25
A very useful little pocket book for those who would like to identify many of the fairly distinctive caterpillars likely to be found reasonably commonly in this country. The illustrations are bright, clear and accurately coloured. The body of the text consists of brief notes on food-plants, season, distribution and habits, exactly what the observer generally needs to know. There is a short introduction dealing with general structure and biology, how to distinguish the caterpillars of butterflies and moths from those of saw-flies, how to collect, rear and preserve, all factual and practical.

One in ten of our British species is selected for illustration and where there are two or three distinct colour forms of a species examples of each are featured. Thirty-eight butterfly caterpillars, including all those likely to be seen in the general countryside, and 165 moth caterpillars are included. In a work of this nature the choice of species is most important. Your reviewer made a selection of 50 moths and found that 39 of these had been included in this book. Among those omitted were such common moths as the Silver Ground Carpet, the Scalloped Oak and the Sallow. The reader is sensibly warned in the introduction that he is not always going to get an accurate identification because so many species are necessarily omitted but the author is to be congratulated on the selection he has made.

This handy little volume has now been added to that select little library that travels permanently on the rear shelf of my car.

JHF

The Year of the Greylag Goose by **Konrad Lorenz**. Pp. 199, with 147 colour photographs by **Sybille** and **Klaus Kalas**. Eyre Methuen. 1979. £9.95
Originally published in 1978 in France, the present English translation is from the subsequent German edition.

The book is summed up in its first six words and in the postscript. It is not, we are told, an attempt to provide a scientifically cohesive description of the life of the Greylag. Rather, we are to regard it as merely an exposition to accompany the photographs which themselves really tell the story. In attributing the major contribution to the photographic skills and devotion of his assistants and research colleagues, Lorenz does less than justice to his own scientific and philosophical comment. As an ethologist, he draws an analogy between goose behaviour and human family life. Nor does he consider it anthropomorphic to find that geese

have a capacity for grief and joy, form homosexual bonds, or indulge in loveless copulatory relationships. His own involvement with Greylags pre-dates his well-known King Solomon's Ring (1952), and obviously he writes with authority.

Although qualified by the statement that the photographs demonstrate how beautiful objective truth can be, it is still hard to believe that they were taken purely for scientific purposes. Even if taken with no particular artistic quality in mind, that same quality must certainly have played a major part in their selection.

The whole book is outstanding and a sheer delight. With this foretaste, the promised monograph on the Greylag is eagerly awaited.

Wings over Wales by **Gerald Summers**. Pp. 207. Collins. 1979. £6.50

The title and dust-cover illustration might lead naturalists to expect a book to their liking. Generally, I think they would be disappointed.

In part it is the story of a kind of Welsh Battersea dogs' home. In the main however, it deals with the author's preoccupation with birds of prey; one suspects that like the dealers whom he condemns, the author too is cashing in on the 'growing public interest in anything connected with falconry'. He does the cause no great service. Falconry is described as a hard-pressed sport, but in the next paragraph as a show business.

On the one hand we find him sympathetic: 'Buzzards look their best when soaring at a height,' or 'no eagle . . . should have to spend his life just looking ornamental.' On the other an apparent callousness shows through: 'suddenly it lunged forward, falling the length of the leash and hung, slowly gyrating with half open wings . . . now swinging like a pendulum.'

His statements that 'the chances of sooner or later losing the bird in the field are considerable,' and 'a hawk has gone adrift, as so frequently happens' also seem to me eloquent arguments for considerably tightening the law.

Though very readable, not a book to my liking.

RFD

Discovering Birds, text and illustrations by **Ian Wallis**. Pp. 127, with many colour and black and white photographs and drawings. Whizzard Press/Andre Deutsch 1979. £4.95

This is a curious little book, a mixture of information for the beginner and for the advanced rarity hunter. The author will be recognized as a leader in the latter category. The early chapters deal with the evolution, structure and classification of birds, an approach to their study and identification and equipment suitable for the job.

However, the main body of the book is a highly personalized guide to a number of scattered and varied bird places throughout Britain, including East Anglia, the Scottish Highlands and Islands, Flamborough Head, Regents Park in London and the Scilly Isles.

These chapters, and the subsequent ones describing a birdwatcher's calendar and exciting incidents from the author's own experiences with birds, are written in an unpretentious and infectiously enthusiastic style rare in bird books today.

In spite of what many may regard as an overpersonal style, the author nevertheless includes much useful information on good bird places, and, importantly, excellent advice on observer self-discipline.

The reproductions of plates from the author's sketchbooks are delightful.

MD

Collins Handguide to the Wild Flowers of Britain & Northern Europe by **Marjorie Blamey** and **Richard Fitter**. Pp. 127. Collins. 1979. £3.95, hardback; £1.95, paperback.

This is essentially a picture book with a minimal amount of text allotted to each species. Miss Blamey's paintings are realistic and the colour reproductions — several per page — are mostly good, so the user should have little trouble in matching his specimen with one of the illustrations, or at least in getting near the right answer, for this book shares the limitations of all such selective pictorial works. The Scentless Mayweed for example is illustrated but none of the other superficially similar, white-flowered, Mayweed-like species and the reference to these in the text is too meagre to permit of more than an approximate identification.

WAS

SHORTER REVIEWS

Taxonomy in Britain by the **Advisory Board for the Research Councils**. Pp. viii + 126. HMSO. 1979. £3.50, paperback
Detailed government report on the status of taxonomy in higher education institutions, research establishments, museums, etc., indicating the courses and facilities available for the subject and the needs on UK and overseas users.

British Fungus Flora: Agarics and Boleti. 2 Coprinaceae: Coprinus by **P. D. Orton** and **R. Watling**. Pp. 149, Royal Botanic Garden, Edinburgh: HMSO. 1979. £12, paperback
Detailed taxonomic treatment of ninety-two species of *Coprinus*, subdivided into three sections (Coprinus, Micaceus and Pseudocoprinus), plus key, ecological list, several indexes and 231 figures (line drawings). Invaluable to the professional mycologist, but alas, at this price, most amateurs will have to rely on borrowing a copy.

First in the Field: America's Pioneering Naturalists by **Robert Elman**. Pp. xx + 231, plus 16 pages of plates. Van Nostrand Reinhold. 1979. £4.45, paperback
Delightful account of the lives and works of 18th and 19th century American naturalists, including Catesby, the Bartrams and Audubon. A highly enjoyable and informative book presented in an attractive format.

Vegetation Dynamics by **J. Miles** (80 pp.) and **Island Ecology** by **M. Gorman** (79 pp.). Chapman and Hall. 1979. Each £1.95, paperback
Two titles in a new series entitled 'Outline Studies in Ecology' edited by Professors G. M. Dunnet and C. H. Gimingham: good foundations and excellent source books for the undergraduate. Text supplemented by numerous figures, tables, extensive bibliography and index. Subjects announced for forthcoming works in this series look very promising and are awaited with interest.

Birds of St Kilda by **Michael P. Harris** and **Stuart Murray** (pp. vi + 42; price £3.50, paperback) and **Distribution of Freshwaters in Great Britain** by **Ian Smith** and **Alex Lyle** (pp. 44; price £2, paperback). Institute of Terrestrial Ecology. 1979.
Latest publications of the Natural Environment Research Council: informative texts, copiously illustrated and attractively presented.

LETTER TO THE EDITOR

Sir,

I am researching the life and achievements of James Bolton, the eighteenth century Halifax naturalist who wrote 'A History of Fungusses Growing About Halifax', 'Filices Britannicae' and 'Harmonia Ruralis'. If any of your readers have letters, diaries or other unpublished material relating to him or to his family and friends I should be most grateful if they would get in touch with me. His family and friends included his brother Thomas Bolton, Judge John Milnes of Wakefield, Dr. William Alexander of Halifax, John Dewhurst of Southowram, Stephen Hartley and Bernard Hartley of Halifax, John Binns (bookseller) of Leeds, Mrs. Ralph, the wife of the Rev. John Ralph of Northgate End Chapel, Halifax, and John Ingham, the master of Cockpit School, Illingworth. I am particularly anxious to trace the diaries of the two last mentioned individuals.

Yours faithfully

G. W. Priestley

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All these publications may be ordered from **The Librarian, The Ferry House, Ambleside, Cumbria, LA22 0LP**. A discount of 25% is given on orders of 5 or more copies of one title (UK only).

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PAGE CONTENTS

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967-1970) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price 50p plus 10p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

LECTURING SERVICE

The Yorkshire Naturalists' Union maintains a list of speakers willing to lecture on a variety of natural history subjects. Secretaries of Affiliated Societies and similar bodies should apply to the Administrative Office, Mr D. Bramley, c/o Doncaster Museum, Chequer Road, Doncaster DN1 2AE for further details of this service.

A REQUEST

It is proposed to start an album of photographs of interest to the Y.N.U. We would be very glad to receive prints of people or events either as a gift or on loan for copying, with dates and as much information as possible. We hope the collection will stretch from the early years of the Union to the present day and become part of the Y.N.U. Archives.

Please send to Mrs J. E. Duncan, 23 Rupert Road, Ilkley LS29 0AQ.

Notice to Contributors to the 'Naturalist'

Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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MIXED HEDGES OF THE FORMER EAST RIDING OF YORKSHIRE

D. J. BOATMAN

University of Hull

Introduction and Methods

A survey of hedges over the whole of East Yorkshire was begun in 1976. Most of those examined were roadside hedges and initially data were collected during journeys along the main routes traversing the county. Later a large number of small roads and tracks were explored in order to obtain as complete a cover as possible.

The unit used for the study was one side of a field and only hedges containing four or more woody species (excluding climbers and scramblers such as *Rubus* spp and *Rosa* spp) were considered. The data were transferred to punched cards and, for ease of retrieval, the cards were arranged in order from west to east. Altogether 117 hedges have been recorded.

Inspection of the pack of punched cards revealed that the distribution of certain species was localized. Since the arrangement accords with the main topographic features of the area, the Vale of York, the Wolds and Holderness, the cards were segregated on this basis and the percentage occurrence of each species (i.e. the percentage of hedges in which the species occurred) determined for each area.

Results

Altogether thirty-two species of tree and shrub were recorded. Seven of these were present in 2 per cent or less of the hedges and are not listed in Table 1. These species included *Berberis vulgaris* and a *Prunus* species, which were recorded only in Holderness, *Frangula alnus* and *Salix fragilis* recorded only in the Vale of York and *Euonymous europaeus* recorded only on the Wolds. *Fagus sylvatica* was found in Holderness and the Vale of York and *Ribes uva crispa* in Holderness and on the Wolds.

1. *Holderness*

All of the hedges investigated occurred on boulder clay. Of the twenty species listed for this area in Table 1, six occurred in more than 75 per cent of the hedges. These species are *Acer campestre*, *Corylus avellana*, *Crataegus monogyna*, *Fraxinus excelsior*, *Prunus spinosa* and *Sambucus nigra*. Most of the species were scattered throughout the area but *Ilex aquifolium* was found only in the south-western part, i.e. west of the River Hull and south of National Grid northing 400.

Most of the data were collected during the summer but nine of the Holderness hedges were visited in spring when the herbaceous flora could also be recorded. Woodland herbs were associated with all of them and the more common species, with the number of hedges in which they occurred, were *Ficaria verna* (9), *Endymion non-scriptus* (8), *Arum maculatum* (7), *Mercurialis perennis* (6), *Stellaria holostea* (5), *Melandrium rubrum* (4), *Brachypodium sylvaticum* (3), and *Nepeta hederacea* (3).

2. *The Wolds, including the Jurassic belt*

These hedges, eleven of which occurred on the chalk, showed a strong resemblance to those in Holderness. Sixteen species were common to both areas and for most of these the percentage occurrence was similar (Table 1). Four species occurred in 75 per cent or more of the hedges, viz. *Coryllus avellana*, *Crataegus monogyna*, *Prunus spinosa* and *Sambucus nigra.* Of the species listed in Table 1 only four that occurred in Holderness were absent from the Wolds, viz. *Populus tremula*, *Salix caprea*, *Ulex europaeus*, and *Ulmus glabra* and the percentage occurrence of these species in Holderness is low. *Euonymous europaeus* was recorded in two Wolds hedges but none of those in Holderness or the Vale of York.

An interesting feature of the data of this area is the high percentage occurrence of *Rhamnus cathartica*. This is one of the common 'calcicolous' shrubs in Britain (Tansley, 1939), others being *Euonymous europaeus*, *Ligustrum vulgare*, *Thelycrania sanguinea*, and *Viburnum lantana*. *Rhamnus cathartica* was present in five of the seven hedges recorded on Jurassic strata and in three of these it was associated with *Thelycrania sanguinea*. At another site on the chalk (York Grounds farm) it was associated with *Euonymous europaeus*.

TABLE 1

Percentage occurrence in hedges of the three topographic regions of East Yorkshire of species recorded in more than 2 per cent of the total number of hedges

	Vale of York	*Wolds*	*Holderness*
Acer campestre	17	35	80
A. pseudoplatanus	23	10	16
Alnus glutinosa	40	0	0
Betula pubescens	30	0	0
B. pendula	17	0	0
Corylus avellana	40	75	78
Crataegus monogyna	97	100	100
Fraxinus excelsior	70	50	76
Ilex aquifolium	10	10	16
Ligustrum vulgare	0	10	2
Populus tremula	15	0	2
Prunus spinosa	50	80	95
Pyrus malus	47	5	18
Quercus spp	67	10	34
Rhamnus cathartica	3	50	2
Salix caprea	17	0	3
S. cinerea	57	5	10
Sambucus nigra	23	85	79
Sarothamnus scoparius	27	0	0
Sorbus aucuparia	17	0	0
Thelycrania sanguinea	3	25	31
Ulex europaeus	17	0	7
Ulmus glabra	10	0	10
U. procera	13	10	9
Viburnum opulus	0	15	16
Total species recorded	26	18	25
Total samples	30	20	67

3. *Vale of York*

Altogether twenty-six species of tree and shrub were recorded in the Vale of York hedges, more than in those of either Holderness or the Wolds. Five of them, namely *Alnus glutinosa*, *Betula pubescens*, *Betula pendula*, *Sarothamnus scoparius*, and *Sorbus aucuparia* were found only in this area. Only one species, *Crataegus monogyna*, was recorded in 75 per cent or more of the Vale of York hedges indicating that there was a greater degree of variation in hedges of this area than elsewhere in East Yorkshire.

The percentage occurrence of *Quercus* spp in the Vale of York hedges is considerably higher than in those of Holderness and the Wolds. This might be related to the way in which these species are managed. In the Vale of York *Quercus* spp are often trimmed along with the other shrubs whereas in Holderness and on the Wolds they are grown as 'standards'.

DISCUSSION

In his study of the hedges of Huntingdon and Peterborough Pollard (1973) gives special consideration to a group of 'mixed' hedges, i.e. hedges composed of several species of tree and shrub. These were located on or near the sites of former woodland and he also refers to them as 'woodland relic' hedges. All of them occurred on clay or limestone soils and may therefore be compared with those of Holderness and the Wolds.

Pollard lists the more common species encountered in his survey and in Table 2 his data, converted to percentage occurrence, are given alongside those for Holderness and the Wolds lumped together. The species marked with an asterisk occurred much more frequently in Pollard's woodland relic hedges than in those believed to have been planted and it can be seen that most of these species also had a high percentage occurrence in Holderness and Wolds hedges. Only *Euonymous europaeus* occurs with a much lower frequency.

In Holderness 57 per cent of the hedges found were located in the south-western part of the area, i.e. west of the River Hull and south of Grid northing 400. According to Darby and Maxwell (1962) this is the only part of Holderness where large areas of woodland were recorded in the Domesday survey. Furthermore it is known that substantial areas of woodland existed in this part of Holderness until the mid-sixteenth century or later.

Many areas of woodland existed in the Vale of York at the time of the Domesday survey (Darby and Maxwell, 1962) but the composition of the mixed hedges in this general area is very different from those in the Holderness/Wolds and Huntingdon/Peterborough areas. The percentage occurrence of all the species marked with an asterisk in Table 2 except *Quercus* spp is markedly lower while species characteristic of wet soils such as *Alnus glutinosa*, *Betula pubescens* and *Salix cinerea*, together with others characteristic of well-drained acid soils such as *Betula pendula*, *Sarothamnus scoparius*, *Sorbus aucuparia* and *Ulex europeaus* are relatively more frequent.

Large areas of wetland formerly existed in Holderness, principally in the valley of the River Hull and in the area known as Sunk Island on the north side of the Humber estuary so it might be expected that wetland species would have been recorded in some of the Holderness hedges. Effective drainage of the Hull valley began in 1760 (Sheppard, 1958) and this appears to have been thorough as very few mixed hedges were found on the valley floor. To judge from pollen data in an area of deep peat near Roos *Alnus glutinosa* appears to have been common in Holderness in the past but the content of pollen of this species drops dramatically in the uppermost sample (Beckett, 1975). This probably corresponds with the period of drainage. *A. glutinosa* is now scarce in Holderness and has been found only at

TABLE 2

Percentage occurrence of certain species in woodland relic hedges of Huntingdon and Peterborough and of Holderness and the Yorkshire Wolds

	Huntingdon and Peterborough	*Holderness and the Wolds*
Acer campestre	63*	72
Corylus avellana	57*	77
Euonymous europaeus	36*	2
Fraxinus excelsior	48	70
Ligustrum vulgare	21	3
Prunus spinosa	97*	80
Quercus robur	21*	29
Sambucus nigra	27	80
Thelycrania sanguinea	45*	30

* See text.

Hornsea, a small wood near Wilfholme and at Long Lane south of Beverley. Wetland at Sunk Island was mainly saltmarsh so it is to be expected that scrub would not have been common in this area.

The term 'woodland relic hedge' suggests that such a hedge is a remnant of a former woodland and might, therefore, provide information on the composition of the woodland. Unfortunately, old woodland is very scarce in East Yorkshire and the only site where it has been possible to investigate the relationship between a hedge and adjacent woodland is Burton Bushes west of Beverley. Burton Bushes is at the western side of the common known as Beverley Westwoods and the boundary is occupied by a hedge. This is now separate from the woodland proper though as little as twenty years ago the woodland reached the hedge. Eight species of tree and shrub occurred in the hedge and all were present and were indeed the more common species in the adjacent woodland. It is interesting to note that *Thelycrania sanguinea*, a species which does not usually occur in the interior of woodlands, was not found in Burton Bushes and was absent from the hedge.

Finally, the scarcity of the calcicolous shrubs on the Wolds compared with chalk and limestone areas further south merits consideration. East Yorkshire appears to be outside the range of *Viburnum lantana* (Perring and Walters, 1962) but of the other shrubs of this type only *Rhamnus cathartica* occurred in more than 25 per cent of the hedges on the Cretaceous and Jurassic rocks. Furthermore calcicolous shrubs rarely occur in scrub on the sides of dry valleys in the Wolds.

There are two possible explanations for this state of affairs. Firstly the Wolds are close to the northernmost limit of distribution in Britain of *Thelycrania sanguinea* and *Rhamnus cathartica* so these species at least might be expected to show a more scattered distribution than on limestones further south. Alternatively the scarcity of these species might be a result of past land use. The Wolds have been farmed intensively since the Bronze Age and only a few areas of 'underwood' were recorded in the Domesday survey (Darby and Maxwell, 1962). Furthermore most of the Wolds land was farmed on the open field system; until 1730 it was the least enclosed part of the former county of the East Riding (Harris, 1959). Thus there must have been few areas where hedges were created from scrub and few sources other than the hawthorn hedges from which invasion of abandoned valley grasslands could occur. This would also explain the difficulty experienced in finding mixed hedges on the Wolds (only eleven were actually on chalk and the majority of these were on the fringes).

It has been pointed out that half of the hedges containing *Rhamnus cathartica* were on Jurassic strata. It is also of interest that this species is a feature of the scrub associated with springs arising at the bottom of the chalk scarp. Occasional bushes have been found at Weedley Springs and near Goodmanham and Millington. Perhaps the land around the heads of these springs has not been completely cleared in the past because it has been so wet.

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RECORDS OF FLOWER VISITING BY SCUTTLE FLIES (DIPTERA: PHORIDAE) IN THE BRITISH ISLES

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The Phoridae are an important group of flower visiting insects. How significant they are has not yet been determined. It is evident, however, that their importance as flower visitors has been under-valued. Firstly they are small and extremely fast moving. By the time a collector has procured the larger flower visiting flies the Phoridae have disappeared. Secondly when they have been procured their identification has proved troublesome. Many early records either fail to identify the flowers or else fail to identify the scuttle flies beyond the family level, or the identities, particularly in the giant genus *Megaselia* Rondani, are suspect. Baumann (1978a) has usefully reviewed most of the published records of flower visiting by Phoridae and supplemented this (1978b) by his own records for members of subfamily Phorinae visiting Umbelliferae. However, the Metopininae are inadequately covered and there is need for a more complete record for the Phoridae as a whole. The present paper reviews the records of flower-visiting by Phoridae in the British Isles and contributes numerous new records.

Twenty-three species of named Phoridae have previously been recorded visiting 16 species of named flowers in the British Isles (Aston, 1957; Carr, 1924; Drabble and Drabble, 1927; Grentsted, 1945; Malloch, 1908; Parmenter, 1965; Schmitz, 1938, 1949; Wood, 1906, 1908, 1909, 1910) including records published by the author (Disney, 1977, 1979a, 1979b).

Together with new data the records (the author's being on 673 specimens belonging to 29 species visiting 33 species of flower) now cover 41 species of Phoridae and 45 species of flowers in the British Isles.

In the list below the author's records are for Malham Moor, Yorkshire unless stated otherwise.

1. *Anevrina unispinosa* (Zett.) — on *Angelica sylvestris* Aston (1957).
2. *Borophaga carinifrons* (Zett.) — on *Senecio jacobaea* Aston (1957).
3. *Citrago citreiformis* (Becker) — on *Angelica sylvestris* Wood (1906), Disney 10 ♂♂ 1–13 Aug 1975: *Heracleum sphondylium* Wood (1906) and Malloch (1908); *Parnassia palustris* Disney 1 ♀ 16 Sept 1971, 3 ♂♂ 29, 31 Aug 1975. In Germany Baumann (1978b) recorded males at *A. sylvestris*, *H. sphondylium*, *Peucedanum ostruthium*, and *Laserpitium latifolium.*
4. *Conicera dauci* (Meig.) — on *Angelica sylvestris* Parmenter (1965), Disney (1977) 2 ♂♂ 1 ♀ 18 Aug 1976 (Athlone Ireland); *Foeniculum vulgare* Parmenter (1965); *Heracleum sphondylium* Grensted (1945), Parmenter (1965), Disney 17 ♂♂ 1 ♀ 13, 17 July 1976, 8 Aug 1977, 7 Aug 1978 (Malham; Chilmark Wiltshire; Juniper Hall, Surrey); *Petroselinum sativa* Disney 1 ♂ 1 ♀ 8 Aug 1977 (Chilmark). In Germany Baumann (1978b) has recorded this species at 8 species of Umbelliferae.
5. *Conicera minuscula* Schmitz — on *Myrrhis odorata* Disney 2 ♂♂ 2 June 1977. In Germany Baumann (1978b) recorded this fly at 6 other species of Umbelliferae.
6. *Conicera pauxilla* Schmitz — on *Heracleum sphondylium* Disney 1 ♂ 8 Aug 1977 (Chilmark, Wiltshire), 1 ♂ 9 July 1978 (Juniper Hall, Surrey). Baumann (1978b) recorded it in Germany at 4 other species of Umbelliferae as well.
7. *Diplonevra funebris* (Meigen) — on *Potentilla anserina* Schmitz (1949); *Heracleum sphondylium* Disney 1 ♂ 13 July 1978 (Juniper Hall, Surrey); *Hypochoeris radicata* Disney 24 ♂♂ 19, 20 July 1975 (Nettlecombe Court, Somerset); *Leontodon autumnalis* Disney 1 ♂ 20 Aug 1977; *Ranunculus acris* Disney 1 ♂ 20 July 1975 (Nettlecombe); *Rubus fruticosus* Disney 1 ♂ 20 Aug 1979 (Croyde, Devon); *Taraxacum officinale* 1 ♂ 22 Sept 1975 (Watford Gap Service Station).

In Canada Judd (1975) recorded this species at *Cornus obliqua*. In Germany Baumann (1978b) recorded it at *H. sphondylium*, *Daucus carota* and *Chaerophyllum bulbosum*. It appears that only the male sex visits flowers.

8. *Diplonevra glabra* Schmitz — On *Pastinaca sativa* Parmenter (1965); *Myrrhis odorata* Disney 1 ♀ 5 June 1976; *Potentilla sterilis* Disney 1 ♂ 1 ♀ 7 May 1976.

9. *Diplonevra nitidula* (Meigen) — on *Anthriscus sylvestris* and *Salix cinera atrocinerea* Parmenter (1965); *Heracleum sphondylium* Disney 1 ♂ 2 ♀♀ 8 Aug 1977 (Chilmark, Wiltshire), 3 ♂♂ 3 ♀♀ 9, 13 July 1978 (Juniper Hall, Surrey); *Ranunculus acris* Disney (1979a) 1 ♂ 12 Sept 1975. In Germany Baumann (1978b) recorded it at 4 species of Umbelliferae. I have also 'observed a male feeding from a runner bean leaf by piercing it at the junction of two veins' (Disney, 1979a).

10. *Gymnoptera longicostalis* Schmitz — this species was not distinguished from *G. vitripennis* (Meigen) until 1933. Wood's (1906) records of *G. vitripennis* visiting *Heracleum sphondylium* and *Angelica sylvestris* are now considered to refer to *G. longicostalis*. Baumann (1978b) recorded this species at 4 species of Umbelliferae.

11. *Megaselia angelicae* (Wood) — on *Angelica sylvestris* and *Heracleum sphondylium* Wood (1910).

12. *Megaselia brevicostalis* (Wood) — on *Angelica sylvestris* Wood (1910); Disney (see below); *Potentilla anserina* and *Taraxacum officinale* Schmitz (1938), Disney (see below). My records are:

Flower	*Date*	*Locality*	♀♀	♂♂
Angelica sylvestris	13 Aug 1975	Malham Moor	1	—
Caltha palustris	8 May 1976	Malham Moor	1	—
Chrysanthemum maximum	25 July 1976	Clapham, Yorks.	—	1
Euphrasia nemorosa	13 Sept 1975	Malham Moor	—	3
Heracleum sphondylium	13 July 1978	Juniper Hall, Surrey	3	—
Hypochoeris radicata	19, 20 July 1975	Nettlecombe Court, Somerset	5	10
Leontodon autumnalis	12, 29 Aug 1975	Malham Moor	9	3
L. autumnalis	20, 21 Sept 1975	Hanlith, Yorks.	1	1
L. autumnalis	20 Aug 1976	Ireland (Disney, 1977)	—	1
L. hispidus	20 Aug 1975	Malham Moor	1	—
L. hispidus	21 Sept 1975	Hanlith, Yorks.	1	—
Magnolia sp	6 May 1976	Ambleside, Cumbria	—	1
Narcissus hispanicus	18, 20 April 1976	Malham Moor	—	4
N. pseudonarcissus	6 May 1976	Ambleside, Cumbria	1	—
Parnassia palustris	25, 27, 31 Aug 1975	Malham Moor	11	10
P. palustris	16 Sept 1976	Malham Moor	—	1
Potentilla erecta	29 Aug 1975	Malham Moor	4	3
P. erecta	16 Sept 1975	Malham Moor	1	1
Potentilla sterilis	7 May 1976	Malham Moor	3	1
Ranunculus bulbosus	22 Aug 1977	Malham Moor	—	1
R. ficaria	20 April 1976	Malham Moor	4	16
Stellaria holostea	31 May 1979	Chilmark, Wilts.	—	1
Taraxacum officinale	24 Sept 1975	Ecton, Northants.	1	1
T. officinale	15, 22 Aug 1975	Malham Moor	1	3
T. officinale	12 Sept 1975	Malham Moor	1	—
T. officinale	7 Oct 1975	Malham Moor	6	4
T. officinale	24 April 1976	Malham Moor	1	—
T. officinale	7 May 1976	Malham Moor	1	—
T. officinale	6 May 1977	Malham Moor	1	—
Tussilago farfara	10, 15 April 1976	Malham Moor	10	10
Veronica filiformis	6 May 1976	Ambleside, Cumbria	—	1
Totals			68	77

13. *Megaselia ciliata* (Zett.) — on *Heracleum sphondylium* Disney 1 ♀ 9 July 1978 (Juniper Hall, Surrey); *Magnolia* sp Disney 1 ♀ 6 May 1976 (Ambleside, Cumbria); *Myrrhis odorata* Disney 1 ♀ 2 June 1977; *Narcissus hispanicus* Disney 1 ♂ 10 May 1977; *Salix caprea* Disney (I. F. G. McLean) 1 ♀ 17 April 1978 (Norwich, Norfolk).

14. *Megaselia coei* (Schmitz) — Schmitz (1938b) recorded this species on 'Moss Campion' *(Silene acaulis)* in Scotland (not on *Platanthera* in Ireland as stated by Baumann, 1978a).

15. *Megaselia dahli* (Becker) — on *Aristolochia sipho* Carr (1924).

16. *Megaselia discreta* (Wood) — on *Angelica sylvestris* Wood (1909).

17. *Megaselia giraudii* — on *Angelica sylvestris* Parmenter (1965); *Heracleum sphondylium* Disney 1 ♂ 9 July 1978 (Juniper Hall, Surrey); *Parnassia palustris* Disney 1 ♂ 11 Sept 1975.

18. *Megaselia hirsuta* (Wood) — on *Angelica sylvestris* and *Heracleum sphondylium* Wood (1910).

19. *Megaselia hyalipennis* (Wood) — on *Acer pseudoplatanus* Disney 1 ♂ 2 June 1976; *Narcissus hispanicus* Disney 2 ♂♂ 17 May 1976.

20. *Megaselia longicostalis* (Wood) — on *Euphrasis nemorosa* Disney 1 ♂ 13 Sept 1975.

21. *Megaselia mallochi* (Wood) on *Oxalis acetosella* Parmenter (1965).

22. *Megaselia manicata* (Wood) — on *Angelica sylvestris* Wood (1910), Disney 7 ♂♂ 2 ♀♀ 24 Sept 1975 (Garbutt Wood, Yorks.); *Heracleum sphondylium* Wood (1910).

23. *Megaselia pectoralis* (Wood) — on *Salix caprea* Disney (I. F. G. McLean) 3 ♀♀ 16 April 1977 (Norwich, Norfolk).

24. *Megaselia pleuralis* (Wood) — on *Hedera helix* Parmenter (1965), Disney 2 ♀♀ 4 Oct 1978 (Nettlecombe Court, Somerset); *Angelica sylvestris* Disney 1 ♀ 9 Oct 1977; *Leontodon autumnalis* Disney 1 ♀ 9 Sept 1977.

25. *Megaselia posticata* (Strobl) — on *Angelica sylvestris* Wood (1908).

26. *Megaselia pulicaria* (Fallén) — I have recorded this species as follows:

Flower	*Date*	*Locality*	♀♀	♂♂
Cirsium arvense	18 July 1975	Nettlecombe Court, Somerset	—	1
Hedera helix	7 Oct 1976	Twyford, Sussex (McLean)	2	4
Heracleum sphondylium	13 July 1976	Juniper Hall, Surrey	—	1
Limanthes douglasii	7 June 1964	Loughton, Essex (Payne)	1	—
Myrris odorata	5 June 1976	Malham Moor	1	1
Narcissus hispanicus	18, 19, 20 April 1976	Malham Moor	62	63
N. hispanicus	4, 7, 17 May 1976	Malham Moor	13	9
N. hispanicus	1, 6, 10, 18 May 1977	Malham Moor	37	23
Parnassia palustris	31 Aug 1975	Malham Moor	1	—
Ranunculus ficaria	20 April 1976	Malham Moor	1	—
Salix caprea	12, 17 March 1977	Norwich (McLean)	2	1
S. caprea	5, 16, 17 April 1977	Norwich (McLean)	7	4
S. cinerea	24 April 1976	Malham Moor	—	1
S. cinerea	10 May 1977	Malham Moor	1	—
Saxifraga diapensoides v. *lutea*	19 April 1976	Malham Moor	1	2
Taraxacum officinale	6 May 1977	Malham Moor	1	—
Totals			130	110

27. *Megaselia pygmaeoides* (Lundbeck) — on *Conium maculatum* Parmenter (1965); *Saxifraga diapensoides* var. *lutea* Disney 1 ♂ 19 April 1976.

28. *Megaselia rufipes* (Meigen) — on *Heracleum sphondylium* Grensted (1945) *Oxalis acetosella* Parmenter (1965); *Narcissus hispanicus* Disney 2 ♂♂ 18 April 1976.

29–32. *Megaselia* spp. — I have collected 9 specimens belonging to 4 species which cannot be named with certainty as yet. *Angelica sylvestris* 1 ♂ of 1 species 29 July 1977, 1 ♂ of a different species 13 Aug 1975; *Salix cinerea* 1 ♂ (of same species) 10 May 1977; *Narcissus*

hispanicus 1 ♀ 18 April 1976, 2 ♂♂ 1 ♀ 18 April 1976; *Heracleum sphondylium* 2 ♀♀ 9 and 13 July 1978 (Juniper Hall, Surrey).

33. *Metopina heselhausi* Schmitz — on *Potentilla anserina* and *Taraxacum officinale* Schmitz (1938).

34. *Metopina oligoneura* (Mik) — all early records of this species visiting flowers need to be treated with caution. In my recent review of the European species (Disney, 1979b) I incorporated most of the following observations. On *Anthemis cotula* 9 ♀♀ 6 ♂♂ 24 Sept 1975 (Ecton, Northamptonshire); *Hypochoeris radicata* 39 ♂♂ 19, 20 July 1975 (Nettlecombe Court, Somerset); *Leontodon autumnalis* 25 ♀♀ 10 ♂♂ 20, 21 Sept 1975 (Kirkby Malham, Yorks.) 2 ♀♀ 3 ♂♂ 26 Sept 1976; *Ranunculus acris* 1 ♂ 20 July 1979 (Nettlecombe), 1 ♀ 4 ♂♂ 21 June 1976 (Kettlesing, Yorks.); *Taraxacum officinale* 5 ♀♀ 13 ♂♂ 24 Sept 1975 (Ecton), 2 ♀♀ 2 ♂♂ 22 Sept 1975 (Watford Gap Service Station).

35. *Metopina pileata* Schmitz — on *Heracleum sphondylium* Disney, 1 ♀ 1 ♂ 13 July 1978 (Juniper Hall, Surrey).

36. *Metopina ulrichi* Disney — on *Heracleum sphondylium* Disney, 1 ♀ 1 ♂ 9 July 1978 (Juniper Hall, Surrey).

37. *Phora aterrima* (Fabr.) — on *Anthriscus sylvestris* Parmenter (1965), Disney 1 ♀ 11 Aug 1975; *Aster tripolium* and *Torilis japonica* Parmenter (1965); *Prunus laurocerasus* Disney (D. A. Smith) 1 ♀ 10 May 1977 (Dagnam Park, Essex).

38. *Phora edentata* Schmitz — on *Heracleum sphondylium* Disney 1 ♂ 9 July 1978 (Juniper Hall, Surrey). The specimen was seized and killed by the spider *Misumena vatia* (Clerck).

39. *Phora stictica* Meigen — on *Heracleum sphondylium* Drabble and Drabble (1927); *Angelica sylvestris* Disney, 9 ♀♀ 1 ♂ 29 July 1977, 4 ♀♀ 3 ♂♂ 25, 29 Aug 1977. In Germany Baumann (1978b) recorded it at both these species as well as 6 other species of Umbelliferae.

40. *Triphleba nudipalpis* (Becker) — on *Narcissus hispanicus* Disney 1 ♀ 3 ♂♂ 18 April 1976, 1 ♀ 7 May 1976, 1 ♂ 1 ♀ 10, 18 May 1977; *Salix caprea* Disney (I. F. F. McLean) 10 ♀♀ 10 ♂♂ 16 April 1977, 2 ♀♀ 5, 17 April 1978. (Norwich, Norfolk). Baumann (1978b) recorded it at *Peucedanum ostruthium* in Germany.

41. *Triphleba opaca* (Meigen) — Colyer (unpublished notebooks) recorded this species at 'sallow catkins', *Narcissus hispanicus* Disney 1 ♂ 4 May 1976; *Salix caprea* Disney (I. F. G. McLean) 1 ♂ 12 March 1977 (Norwich, Norfolk).

List of Plants

The names follow Clapham *et al.* (1962). The numbers against each species refer to the phorid species above.

Acer pseudoplatanus 19.
Angelica sylvestris 1, 3, 4, 10, 11, 12, 16, 17, 18, 22, 24, 25, 29, 32, 37, 39.
Anthriscus sylvestris 9, 37.
Anthemis cotula 34.
Aristolochia sipho 15.
Aster tripolium 37.
Caltha palustris 12.
Chrysanthemum maximum 12.
Cirsium arvense 26.
Conium maculatum 27.
Euphrasia nemorosa 12, 20.
Foeniculum vulgare 4.
Hedera helix 24, 26.
Heracleum sphondylium 3, 4, 6, 7, 9, 10, 11, 12, 13, 17, 18, 22, 26, 28, 35, 36, 38, 39.
Hypochoeris radicata 7, 12, 34.
Leontodon autumnalis 7, 12, 24, 34.
L. hispidus 12.
Limanthes douglasii 26.
Magnolia sp 12, 13.

Myrrhis odorata 5, 8, 13, 26.
Narcissus hispanicus 12, 13, 19, 26, 28, 29, 31, 40, 41.
N. pseudonarcissus 12.
Oxalis acetosella 21, 28.
Parnassia palustris 3, 12, 17, 26.
Pastinaca sativa 8.
Petroselinum crispum 4.
Potentilla anserina 7, 12, 33.
P. erecta 12.
P. sterilis 8, 12.
Prunus laurocerasus 37.
Ranunculus acris 7, 9, 34.
R. bulbosus 12.
R. ficaria 12, 26.
Rubus fruticosus agg. 7.
Salix caprea 13, 23, 26, 40, 41.
S. cinerea 26, 29.
S. cinerea atrocinerea 9.
Saxifraga diapensoides var. *lutea* 26, 27.
Senecio jacobaea 2.
Silene acaulis 14.
Stellaria holostea 12.
Taraxacum officinale 7, 12, 26, 33, 34.
Torilis japonica 37.
Tussilago farfara 12.
Veronica filformis 12.

Discussion

The above review has aimed to provide a basis for future work on the role of Phoridae as flower visitors in the British Isles. It is clear that more detailed studies are required if an adequate picture is to be obtained since so far less than 15 per cent of the species of Phoridae on the British List have been recorded visiting flowers. The reasons for this are no doubt due to inadequate observations of a sufficiently wide variety of flowers at a sufficiently wide range of times of day and seasons of the year. However, species of *Megaselia* are frequently observed lowering their mouthparts onto the surface of leaves coated with honeydew. In addition the observations of the male *Diplonevra nitidula* seen to be feeding from a leaf by piercing it at the junction of two veins (Disney, 1979a) further suggests that many Phoridae obtain plant sugars other than from flowers. The observations that *Diplonevra funebris* may visit flowers in numbers and yet only males have been seen to do so is not without interest. The proboscis of the male is decidedly more slender than that of the female (of Figs. 148a and 148b in Schmitz, 1949), or of that found in other members of the genus in either sex. The selection of pollen or nectar by phorids and the periodicity of feeding (both daily and seasonal) need investigation.

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NOTES ON SOME SAWFLIES (HYM., SYMPHYTA) FOUND IN SCOTLAND, WITH A DESCRIPTION OF A NEW SPECIES OF *PACHYNEMATUS* KONOW FROM WESTER ROSS

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The contents of this work are intended to supplement and extent those given by Liston (in press). Observations on biological aspects of some species are given, but mainly distributional data are recorded. Species not previously formally recorded from Scotland in the literature are marked with an asterisk.

Trichiosoma and *Cimbex* (Cimbicidae)
The adult feeding habits of the species in these two genera have excited much speculation, but there is a lack of hard evidence to support the idea of their being predatory. Some observations on adult specimens of *Trichiosoma latreillei* Leach and **T. lucorum* (L.) kept in captivity may therefore be of interest. During late June of 1979, one male and one female of *lucorum* and one female *latreillei* were collected in a birch wood in the upper Whitadder Valley, East Lothian. The specimens were kept separately in transparent plastic containers. Each container held a sprig of birch with the base of its stem in water. A wide variety of insects and insect larvae were introduced to the containers in the hope that the sawflies might consume some of them, but at the end of three days the *Trichiosoma* had not shown any interest in the smaller insects. Neither had the plant material been touched. On the fourth day the *lucorum* female was dead and the other two specimens were obviously moribund. It was at this point that I noticed a significant comment in Lorenz & Kraus (1957). These authors noted that adult cimbicids can 'ring', or remove the bark, from the twigs of trees and thereby gain access to the sap. This led me to think that the sawflies were suffering from dehydration rather than any lack of solid matter. Water was sprayed onto the birch sprigs in each of the two remaining containers and the insects' reactions were watched. The effect was immediate in the case of the male *lucorum*. This specimen was disturbed by a drop of water and started to crawl up the birch stem. On reaching a small drop of water it extended its glossa and paraglossa and using a 'lapping' motion, drank the drop in less than a minute. The sawfly then extended its palpi, and with these in motion, moved off to another drop. The *latreillei* female drank for over fifteen minutes at a small pool of water which had formed at the foot of the container. Despite the fact that I kept the insects well supplied with water, they were both dead eight days after the date of their collection.

These observations raise some interesting questions. Although they were not carried out in natural conditions, it would seem that *Trichiosoma*, and probably also *Cimbex*, have little need of solid food, only water. Presumably water is normally obtained in the form of dew or raindrops on the vegetation. The 'ringing' of twigs may only be carried out as a last resort in very dry weather, and may not even be developed in the British populations of these Cimbicidae. Despite the note made by Howard, L. O., 1896. *Proc. ent. soc. Wash.*, 4:31 (cited in Benson, 1950) about a specimen of *Cimbex americana* found in flight with a larva of the gypsy moth in its grasp, I find it hard to believe that a predatory insect would have to resort to the sap of trees for its moisture requirements.

Benson (1951) stated that *T. lucorum* is absent from Scotland. It is in fact just as common as *latreillei*, and often flies with that species. There is of course some doubt as to their validity as species (Enslin, 1912–17).

Aneugmenus padi (L.) (= *coronatus* Kl.)
This species is almost completely parthenogenetic in Britain. The only male known to Benson (1952) was found in Hertfordshire, in 1929. A second British male was found in Beecraigs Country Park on 27. vi. 1979. It is interesting to note that while the species its parthenogenetic in Central and Northern Europe (Hellén, 1943. Muche, 1967–70), males are commoner than females in Southern Europe (Benson, 1968).

Heterarthrus aceris (Kaltenbach)
An adult of this species has already been found on Corstorphine Hill, Edinburgh (Liston, in press). Further visits to this locality revealed that practically every *Acer pseudoplatanus* L. had one or more of its leaves mined by this species' larvae.

Tenthredo maculata Geoffroy
On 1. vii. 1979 I watched a female specimen of this distinctive species land on some cuckoo-spit on the stem of a bramble. The sawfly fed, or drank, at the froth for a few minutes and then pushed its head into it and extracted the Homopteran nymph, which it flew off with. Benson (1950) records sawflies feeding at cuckoo-spit but does not mention the fate of the inhabitants.

Priophorus rufipes (Lep.)
A single male of this species was captured on Corstorphine Hill, Edinburgh, Midlothian with some specimens of *Fenusa ulmi* (Sundewall) on 14. vi. 1979. Previously recorded from as far north as Dumfries (Benson, 1958).

**Pristiphora denudata* Konow
During vi. 1979 three female *denudata* were collected on Corstorphine Hill, Edinburgh. Two were swept from *Sorbus aucuparia* L., the other from *Betula*. The larval foodplant of this species is not known, but since *P. pallidiventris* (Fallén), a closely-related species, is known to feed on various low growing Rosaceae, *Sorbus* is a distinct possibility as one of the food-plants of *denudata*.

Nematus melanspis Hartig
An unusual specimen of this common species was found on Corstorphine Hill on 28.vi.1979. This female has a complete and well-defined suture dividing the anterior mesonotal lobes. It is worthwhile noting that Benes (1967, 1968) has conducted studies into the ways in which the structure of *Pontania* imagines vary according to the conditions which are imposed upon them as larvae. He found that humidity, temperature and even lighting played a part. It is not surprising, therefore, that sawflies vary extremely in morphology and coloration in the arctic regions of the world (Benson, 1962). The specimen of *N. melanaspis* mentioned above may somehow have been subjected to extreme warmth or cold at a critical time in its development.

Pachynematus apicalis (Hartig)
A male of this sawfly was collected beside the Bonaly Burn, Pentland Hills, Midlothian, 28.vii.1979. In Scotland the species has previously been recorded from Lanarkshire, Dunbartonshire and Inverness (Benson, 1958).

Pachynematus torridonensis sp. n.
FEMALE. Colour. Black, except for the following parts which are whitish: clypeus, labrum, tegulae, costa, subcosta, stigma, ± apices and anterior parts of all femora (but very variable), tibiae except for apices, and bases of basitarsi. The post orbital areas and the ventro-anal region of the abdomen are brownish.

Head. Shining between ill-defined punctures. Subparallel behind eyes. Antenna as long as costa of forewing, with 4th segment slightly longer than the longest axis of an eye. Frontal wall complete. POL:OOL = 1.0: 1.6. Pubescence pale and very short.

Thorax. Shining with feeble sculpture. Furrow dividing anterior lobe of mesonotum obsolete posteriorally. Scutellum, without metascutellum, less than $1\frac{1}{3}\times$ as broad as long (as in Fig. 2 of Benson, 1967). Inner hind tibial spur slightly shorter than the apical width of the hind tibia. Hind tibia about $1\frac{1}{3}\times$ as long as hind femur (without 2nd trochanter). Hind tarsus three-fifths as long as hind tibia. Hind basitarsus $3\frac{1}{2}\times$ as long as its apical width.

Abdomen. Tergites rather dull with alutaceous sculpture. Sawsheath subtriangular, as in *P. apicalis* (Htg.) (see Benson, 1958, Fig. 770). Saw not very distinctive (Fig. 1): Its number of teeth varies between 16 and 19.

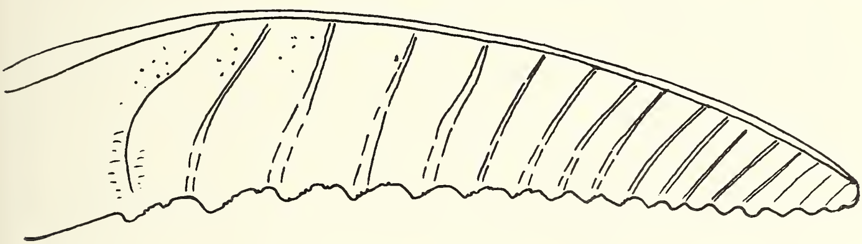

FIGURE 1
Saw of *Pachynematus torridonensis* sp.n. (paratype)

MATERIAL. Holotype ♀. Coire Mhic Nobuil, near Allt Toll a'Mhaidaich (150 m), Wester Ross, SCOTLAND, 16.5.78. PARATYPES. 1♀, Craig (5 miles north-west of Diabeg (sea-level), W. Ross. 18.5.78. 1 ♀, Coire Dubh Mhor, on slope below Stùc a'Choire Dhuibh Bhig (350 m), W. Ross, 19.5.78. Holotype and first paratype deposited in Royal Scottish Museum, Edinburgh. Other paratype in author's collection.

Length of specimens: 5.5–6.0 mm.

Biology. A species of probable arctic affinities. Larval foodplant possibly a species of *Carex*, from which two of the above mentioned specimens were swept.

Affinities. *Pachynematus torridonensis* sp. n. is clearly allied to the *P. apicalis* group (as defined in couplet 8(6) of Benson's (1958) key) except for the short inner hind tibial spurs, which distinguish it from all these species except *P. omega* (Benson).

It differs from *P. apicalis* in the following ways. Antennae shorter (as long as costa and half stigma in *apicalis*). Tarsi shorter (three-quarters as long as hind tibia in *apicalis*). Hind basitarsus shorter (four and a half times as long as broad in *apicalis*). No confusion should arise with *P. clibrichellus* (Cameron) which has long fuscous pubescence on head and thorax. Probably differs from female of *P. omega* (Bens.) (only known from males taken in the Swiss Alps. Benson, 1955) in having shorter tarsi and antennae. *P. omega* also has its mesopleura only slightly tuberculate. *P. moerens* (Förster) has its hind tarsus much longer (as long as hind fibia). Although *moerens* has the same length of antenna as *torridonensis*, the former has the fourth segment shorter than the longest axis of the eye.

ACKNOWLEDGEMENTS
I thank Messrs. Q. Laidlaw, A. Leslie, S. McMaster and M. Robertson for their kind assistance in collecting the Torridon specimens.

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HYMENOPTERA IN YORKSHIRE, 1975–78

H. E. and J. H. FLINT

Several entomologists have been working steadily on the sawflies and on the aculeate wasps and bees during the period since the last report but collecting these insects is particularly susceptible to the weather. As a general rule they fly freely in warm, sunny weather and the collector's field days must coincide with the sunshine if he is to have much hope of success. A fortunate discovery of the sawfly *Dolerus coracinus* (see below) inspired repeated visits to the locality, 50 miles from home, in successive years in attempts to obtain further examples. All were defeated by the weather. Either the sun disappeared, the wind rose or the temperature dropped. A curiously contrary observation was made on a dull, cool, late afternoon on Strensall Common by J.H.F. who found quite a number of the little rubytail wasp *Notozus constrictus* Foerster flying over a sandy bank. This was surprising because the rubytails generally only fly in hot, bright sunshine. The social bees and wasps, of course, are well known to continue their activities in cold, dull weather.

Since the last report *Bombus magnus* Vogt has been reported in the county. Its status, separate species or sub-species (or even form) of *Bombus lucorum* L., may still be uncertain. As it may well be an upland and northern bee while *B. lucorum* is lowland and southern, systematic collecting of both in Yorkshire may help to distinguish more clearly the range of each.

Reports have been received from Dr. M. E. Archer, Mr. W. A. Ely and Mr. P. Skidmore to whom we express our thanks. Only a selection of the less common species is listed. The usual symbols denote county (†) and vice-county (*) additions.

SYMPHYTA

**Pamphilius balteatus* (Fallén) (62) Ashberry Nature Reserve, 6/6/76; H.E.F.

**Xiphydria camelus* (L.) (62) Carnelian Bay, Scarborough, 15/8/75; one on the beach, J.H.F. Local and scarce, its larva mines the trunks of alders. There are many dead and dying alders on the lower and more exposed parts of the clay cliffs in the bay.

**Hartigia xanthostoma* (Eversmann) (64) Hetchell Wood Nature Reserve, 6/6/78; H.E.F. Only previously in Yorkshire from Ashberry, 1971.

**Aneugmenus fuerstenbergensis* (Konow) (64) Lindley Wood, 29/5/60; H.E.F. Bilsdale is the only other known Yorkshire locality.

†*Dolerus coracinus* Klug (62) Riccaldale, one female, 7/4/74; H.E.F. Known to Benson (1952) only from a series of females taken at Aviemore in 1946.

**D. triplicatus* Klug (61) Skipwith Common, 1/6/76; H.E.F. Spurn and Hetchell Wood are the only other known Yorkshire localities.

Tenthredo fagi Panzer (63) Harthill, Rotherham, 27/6/78; M. Crittenden and D. W. Twigg (fide W.A.E.). A scarce insect, mainly south-eastern, not reported in Yorkshire for many years past.

**Hoplocampa alpina* (Zetterstedt) (62) Ellerburn, on rowan, 20/6/76; H.E.F. Oxenber Wood is the only other known Yorkshire locality.

†*H. chrysorrhoea* (Klug) (64) Adel Dam Nature Reserve, Leeds, 24/4/59; J.H.F.

†*H. rutilicornis* (Klug) (62) Ashberry Nature Reserve, on blackthorn *(Prunus spinosa)*, 21/5/78; H.E.F.

†*Dineura testaceipes* (Klug) (64) Temple Newsam, Leeds, 28/7/64; W.A.E. (det. J.H.F.).

Pontania tuberculata (Benson) (64) Breary Marsh, Leeds, 28/5/63; J.H.F. Malham Tarn was the only English locality known to Benson (1958).

**Nematus crassus* (Fallén) (63) Shirley Pool, Askern, 22/6/75; J.H.F.

†*N. salicis* (L.) (64) Fairburn Ings Nature Reserve, 9/6/63; H.E.F.

The following more common species are additions to vice-county lists: *Empria alector* Benson (65) Reeth; *Birka cinereipes* Klug (63) Rotherham, (64) Leeds; *Rhogogaster chambersi* Benson (61) Fordon Bank; *R. punctulata* (Klug) (65) Addleborough; *Croesus varus* (Villaret) (64) Wistow; *Pachynematus kirbyi* (Dahlbom) (61) Wheldrake Ings.

ACULEATA

†*Prenanteon basalis* (Dalman) (63) Bilham sandpit, 28/7/76; C. A. Howes (det. P.S.). The black larval sacks of the dryinids are commonly seen on the hosts which they parasitise, the cicadellid and delphacid hoppers, but the distinctive adults are not easily found.

Sapyga quinquepunctata (F.) (62) Heworth, York, 18 and 25/5/77; M.E.A.

Dipogon variegatus (L.) (62) Ashberry, 22/8/76; J.H.F.

†*Ancistrocerus gazella* (Panzer) (62) Heworth, 22/6/76 and subsequently; M.E.A. This is far to the north of any locality known to Spradbery (1973).

Symmorphus mutinensis (Baldini) (62) Keld Head, 9/7/78, 8/8/78; G. King (teste M.E.A.).

Astata pinguis (Dahlbom) (61) Allerthorpe, 22/6/76; M.E.A.

**Crossocerus capitosus* (Shuckard) (65) Reeth, colonies on the river bank, 18/7/76; J.H.F.

**C. cetratus* (Shuckard) (62) Ashberry, 12/6/77; J.H.F.

Ectemnius ruficornis (Zetterstedt) (62) Heworth, 10/8/76; M.E.A.

**Nysson trimaculatus* (Rossius) (61) Skipwith Common, 8/7/78; M.E.A. Armthorpe is the only previous record.

Gorytes quadrifasciatus (F.) (61) Allerthorpe, 6/7/75; Skipwith, 28/7/78; M.E.A.

Nomada fulvicornis F. (= *lineola* Panzer) (61) Faxfleet, 3/6/78; J.H.F.

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BOOK REVIEWS

The Moths and Butterflies of Great Britain and Ireland edited by **John Heath** and **A. Maitland Emmett**. Vol 9, Sphingidae — Noctuidae, Noctuinae and Hadeninae. Pp. 288, 16 colour plates, 203 maps, many text figures. Curwen Books. 1979. £25

During the greater part of this century British lepidopterists have relied on two quite different works to identify the butterflies and larger moths, those of Richard South with colour plates and of Edward Meyrick with dichotomous keys, brief descriptions and no plates. The majority can be reliably named with South simply by matching the specimen to the illustration but where there is doubt there is generally little help in the text. Most amateurs, aud surely all beginners, rely on South. Meyrick's keys, unsupported by coloured illustrations, are by comparison slow and tedious to use and it is possible for the less experienced to arrive at completely wrong conclusions. This new work combines the features of Meyrick and South, dichotomous keys to species, descriptive text and coloured illustrations of all the species and of many of the varieties and forms.

The coloured illustrations are beautifully and accurately drawn and coloured by Brian Hargreaves. The detail is often picked out just a little more clearly than in life, truly splendid, clear guides to determination. The colour printing also has a freshness of tone that was absent from the first volume. Mr Hargreaves is to be congratulated. However, he will be as dismayed as is the reviewer to see how faulty register of the colour printing has ruined Plate 1 and blurred Plate 5. The contrast in clarity between the tiger moths on the latter plate compared with those on Plate 6 is striking. Fortunately the distinctive hawk moths on Plate 1 can still be recognized but how sad that we cannot see the artist's true representation of the magnificent Oleander Hawk. It is natural to turn first to the attraction of the colour plates but the meticulously drawn line figures by Maureen Lane equally deserve praise.

Most determinations will still be made by reference to the coloured illustrations and the keys and descriptions used to supplement these in cases of doubt. Anyone who has emptied a light trap knows how many brown noctuids, more or less rubbed, seem to fall into this category. The reviewer has checked some of these against the plates and the keys and so far in each case has reached a convinced conclusion. The keys and descriptive text are compiled by specialists and seven entomologists have contributed to the systematic part of this volume. It will generally be possible to run typical examples and some colour forms satisfactorily through the keys but dark forms, e.g. the Shetland form of *Hadena confusa* (Plate 12, Fig 22) will not work out satisfactorily. The details of life history are concise but full. The 10 km^2 distribution maps compiled by the Biological Records Centre indicate clearly the range of the species and although much work on these is still to do they are a tribute to the many entomologists, amateur and professional, whose field work and patient recording have produced the information on which the maps are based. To some extent the maps are affected by the incidence of recorders and it is clear that in Yorkshire the south-east and the north-west have received little attention. The broad patterns of distribution, southern, south-western, northern, coastal, etc, are clearly revealed.

The systematic part is preceded by a short chapter on reversible structures, the 'scent brushes', which have only recently received much attention. There are also three colour plates of photographs of widely varying quality covering a range of families but these do not appear to be in any way linked to the text and the reason for their inclusion is not very apparent.

This is undoubtedly the major work of reference its publishers claim and it will be welcomed by all entomologists who can afford it or consult it in their local library. This volume is particularly welcome since it includes part of Noctuidae, a family with its full share of awkward species. The second to appear of the projected eleven volumes (Vol 11 will deal with larvae), it is three years behind the schedule originally announced and it is impossible to think that the target date of 1982 for the whole work can be met. It is also clear that the whole will cost several hundred pounds and those who can purchase volumes at intervals as they appear will be wise to do so and rejoice in their possession.

JHF

SOME PARTICULAR OBSERVATIONS AT A BADGER SETT OVER AN ELEVEN-YEAR PERIOD

R. J. PAGET
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Published reports of intensive badger watching at a single sett over several years are distinctly rare. Regular watching over a seven-year period at a sett in Mirfield in West Yorkshire was undertaken by Middleton (1974). Soper (1955) describes activity over a four-year period, and Burness (1970) followed an albino animal for seven years. Since such reports are uncommon it is felt that this paper may be of interest, concentrating on the fluctuating number of badgers resident at the sett and some of the less usual examples of their behaviour. The data from such a study, and conclusions drawn therefrom, must be analysed with caution, appreciating the difficulties of badger watching in the field with no other aids than torch and binoculars; and in arriving at some conclusions a certain amount of speculation is inevitable.

The sett was watched on average once a week during the eleven years 1969–79 inclusive, at certain times several nights consecutively, but at other times less frequently when other setts were being studied.

The sett is at Harthill with Woodall in South Yorkshire, on the side of a sandstone quarry adjacent to arable land, pasture and garden allotments, with mainly mature sycamores for cover. There is dim illumination from the village and good views of the badgers are possible as they move off from the sett silhouetted against the skyline.

At the beginning of the study an outlying sub-sett in the hedgerow of an adjacent field was occasionally used but not after 1970, and the social group used only the study sett. There are two other main setts in the vicinity, one continuously occupied and sited in mixed woodland about a mile away, and a second about half a mile distant also in a quarry which became inactive in 1975 and remains so. The study sett held badgers throughout the eleven years, varying from two to six animals.

1969

At the beginning of the year three badgers were commonly seen together, a boar and sow and one of unknown sex which was not seen after the first week of April. On **13 Feb** the boar crossed from one of the pair of holes, and emitting a high-pitched whinneying call cautiously entered the other. He remained below for more than an hour, and with hindsight this behaviour may be taken as indicative of the presence of sow and offspring in this part of the sett. (It is also possible to speculate that below-ground mating may have occurred.) Two cubs were successfully reared, one first seen above ground on **13 May** and the other on **6 June**. These remained at the sett for the rest of the year. On **21 Sept** the sow was found dead near the sett. Towards the end of August some chickens were killed nearby and a badger was seen leaving an open hen hut on two occasions; this occurred sporadically through 1970 and the boar was eventually shot in November 1971 whilst asleep among dead and living chickens inside a roost. No further trouble of this kind followed.

1970

The above-mentioned boar was seen throughout the year. On **17 May** a young female weighing 21 pounds, and not lactating, was found dead beside the road some 200 yards from the sett. Surprisingly, however, two cubs appeared: on **31 May** one was seen and both the next night. This was surprising, since only the boar and two yearlings were thought to be at the sett, and one of the latter had now been killed. Had these cubs been mothered by a yearling? This is extremely rare, but if so it lends support to the report by Knight (1970) and referred to by Neal (1977) when a semi-tame known yearling was found to be in milk. Excited behaviour by the boar had been seen on **12 Feb** possibly coinciding with post-partum oestrus.

However, another more likely explanation exists, since a third adult badger was seen the night after the cubs were first seen; this may have been a sow who had recently moved from the sub-sett, bringing her cubs with her. Middleton (1974) described a similar happening in his series. The two cubs were regularly seen throughout June and July but not thereafter. A fall in the number of animals seen occurred in late July and lasted through to early September. This pattern was repeated in 1972/73/75/76/79 and was thought to be associated with lying out above ground. Attempted mating, when all three badgers were above ground, was seen on **21 Oct**, and since the third badger was totally uninterested it seemed likely this was a female.

1971
At the beginning of the year three badgers were thought to be in residence, the boar and sow from the previous year and the adult which had appeared in June, thought to be a sow. Three instances of sexual activity were seen in the early months: purring on **25 Jan** and again on **7 Feb** (widely enough separated dates to infer two different females being on heat, and supporting the theory of the previous October that the population was one male and two females), and on **25 April** attempted mating with much excitement. Only one cub was seen this year, initially on **3 May**. On two occasions, **28 May** and **7 Sept**, four adults and not the usual three were seen. Attempted mating by an excited boar, but with a sow which would not stand, was seen on **6 Nov** following a period of intense gathering of bedding material. Two days later the boar was shot in the chicken hut as previously mentioned.

1972
Despite the boar being shot in 1971, this sex was definitely represented in the new year (perhaps the occasional visitor seen the previous summer), since mating was witnessed on **14 Feb**. Union was seen for twenty minutes, but the total time was longer as mating was in progress as the sett was approached. After breaking the boar scratched the ground as described by Paget (1970) at another sett. The boar purred again the following evening but left the sett without others emerging. On **13 March** the boar was again sexually excited, and purring deeply half entered one of the entrances but was chased away by the sow. As she came back to the sett a third adult emerged and the two left the quarry together. Both were thought to be females, and this episode along with the definite mating a month earlier fits well with the interval between the eventual emergence of two cubs, one on **16 April** and a second on **4 May**, suggesting that one cub was born to each sow, the mid-February and mid-March sexual activities representing post-partum oestrus in each. Only one cub was seen after **18 May**, and after **29 May** one sow also disappeared: possibly the cub died, followed by its mother. Interestingly, an adult's skull with some dried soft tissue still attached was found outside the sett in December. After the end of September only two badgers were seen.

1973
Only two badgers overwintered, boar and sow. On **4 Feb** the boar emerged from one hole, and, purring, crossed to another and half entered. It was from this hole that the sow eventually brought a cub on **20 April**. Neal (1977) points out that a good indicator of the hole from which cubs will first emerge is that into which bedding is taken in February and March. Whilst agreeing with this, it is also suggested that the entrance which will be used is that into which the boar purrs at the time of post-partum oestrus. A second cub was eventually seen. One of the cubs remained at the sett certainly until late December.

1974
Some purring by the boar was noted on **3 Feb**. Two cubs were seen above ground on **4 June** but not again after **25 Aug**. Only two adults were seen during the year.

1975
An example of marking by depositing dung was seen on **24 Jan**, when the boar after entering a second hole re-emerged to defaecate on the spoil heap outside: it was this hole the sow and cubs used later in the year. Daytime visits to the sett showed many dung pits in the proximity

at this time. A third adult arrived, being seen first on **18 May** and then at intervals throughout the year. Two cubs appeared above ground, the first seen initially on **1 May** and the second on **13 May**; yet again these had disappeared by mid-August.

1976

The sett was known to hold three badgers in January, February and early March. On **9 Feb** the boar was purring as he patrolled and as he later left the sett area. Only two adults were seen after mid-March and during the remainder of the year. On **13 April** the decomposing carcase of an approximately four-week-old baby badger was found outside one of the holes, probably born in the first week of February to the animal not seen after mid-March, which had probably also died.

1977

On **11 Feb** the boar was seen to deposit dung on the sett after emergence (compare 24 January 1975). Then he entered one of the holes from which the sow ran out with the boar in pursuit. They ran from the sett area but she returned after ten minutes and following a short period of scratching she went below. Two cubs were seen on **20 April** but after the first week of May only one was present; this stayed until the next summer. On **22 June** the boar was heard to be purring as he left the sett. On **26 Aug** during an episode of digging, the boar squatted to urinate on the freshly excavated earth; after a few minutes the sow came over and did likewise, at the same place and in the same squatting position. Mutual grooming followed during which the boar purred intermittently. The sow became more excited and began to race around the vicinity of the sett, returning from time to time with tail erect musking the boar. Both then made off into the corn field and purring and yaps indicated mating to be in progress.

Thus at least two if not three episodes of oestrus in the same sow were witnessed this year.

1978

The cub from the previous year was seen until mid-June but not thereafter. A sequence of sexual behaviour was observed in the early part of the year, with the boar purring nightly from **30 Jan** and culminating in mating on **6 Feb**. This took place in a furrow in the adjacent ploughed field and lasted for more than twenty minutes. The most interesting feature of the sequence however was on **2 Feb** when the boar attempted to mate both of the other animals, i.e. the sow and the daughter yearling. Two cubs were seen above ground, both on **20 May**. Of these one stayed through the winter but the other was not seen after late August.

The evening of **6 June** produced an occurrence not seen before when the boar curled up and went to sleep for about ten minutes outside one of the holes, lying in the rays of the setting sun; he was awoken by the return of the others.

1979

There was a period of excitement in which all three badgers, boar, sow and yearling were seen chasing each other in the snow on **3 Feb**, but there were no clues that this was in any way of sexual significance. A cub was seen on **16 April** and by the end of the month three cubs were emerging, bringing the total number of badgers at the sett to six, the most during the period of study, and probably during its existence. On **2 July** a most unusual happening was witnessed when the boar after emergence from one hole, ran across to the sow and yearling, just emerged from another hole; he jumped on the back of the latter which flopped to the ground. The boar then dragged it in its flaccid state by the scruff of the neck across the terraces and into the hole from which he (the boar) had emerged. Within moments the yearling ran out and left with the sow, but the boar did not immediately re-emerge. The yearling was never seen again and it is tempting to think that this was submission of a male offspring to its father.

Various combinations of boar, sow and cubs were seen during July and August, but the numbers were very variable; one all-night watch was rewarded by the sighting of one animal

only, probably the sow; certainly she was the most regularly seen at this time. By September and October the number seen was consistently three: boar, sow and a grown cub. Attempted mating occurred on **4 Aug**, and a brief interval of purring was heard from within a hole on **17 Nov**.

Summary and Discussion

(1) Sexual activity was witnessed in ten of the eleven years, predominantly in February, adding further support to views expressed by Paget and Middleton (1974), but also in April, June, August, and October. Long duration mating was seen on four occasions, twice in February and twice in August. At least two episodes of oestrus were seen in the same sow in the same year. One sequence of sexual activity by the boar was observed for eight days, when probably both sow and female yearling were on heat with overlapping oestrus, that in the sow being post-partum, and the other its first.

(2) Breeding occurred in each of the eleven years of study with the number of cubs reared as follows:

1969	2	
1970	2	
1971	1	
1972	2	one to each of the two females?
1973	2	
1974	2	
1975	2	
1976	1	this died before coming above ground
1977	2	
1978	2	
1979	3	

(3) Cubs sometimes remained at the sett through the winter becoming yearlings:

1969 . . . both, one killed on the road.
1970 . . . neither.
1971 . . . possibly stayed until December.
1972 . . . neither.
1973 . . . one of the pair.
1974 . . . neither.
1975 . . . neither.
1976 . . . (no live cubs came above ground).
1977 . . . one of the pair.
1978 . . . one of the pair.
1979 . . . one of the three.

Either cubs are dispersing to other setts, which seems very unlikely, or mortality is high in the cub population in the summer.

(4) Yearlings appeared in the main to leave during the spring or summer. These may be filling gaps at other setts: indeed unexplained arrivals of badgers occurred at this sett during the time of study. However, in a limited experiment in Gloucestershire, Cheeseman and Mallinson (pers comm), using marked yearlings, have not demonstrated any movement away from the sett to other nearby territories. Possibly this reflects the much greater badger density and the more intense territorial behaviour in that area.

(5) The number of badgers at the sett tended to be least in late summer, explained mainly by some animals lying up in nearby fields of cereals (one was once found dead near the sub-sett after combine harvesting).

(6) Possible submission of a yearling, thought to be a male, to its father was witnessed. The aggressive behaviour by the boar brought about the permanent leaving of the sett by the offspring.

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Y.N.U. BRYOLOGICAL SECTION: ANNUAL REPORT 1979

T. L. BLOCKEEL

1979 has been another successful bryological year. Excursions have been held in the Derwent Valley (V.C. 61) and in Dentdale (V.C. 65). The former has already been reported (Blockeel, 1979a) and the latter proved to be one of the most productive sectional meetings for many years. In addition, in November 1978, the British Bryological Society held a taxonomic workshop in Leeds, followed by an excursion to Hardcastle Crags (V.C. 63) which resulted in the rediscovery of *Bazzania trilobata* and other important records in what was considered a well-worked locality (see Blockeel, 1979b).

Notes have been published in the Naturalist on the distribution of *Orthothecium rufescens* (Shaw, 1979) and on *Andreaea* at Hebden Bridge (Blockeel, 1979c).

Records

Recent taxonomic work relevant to Yorkshire species has included the following:

Plagiochila spp. Paton (1977) has reinstated *P. killarniensis* as a species distinct from *P. spinulosa*. Moat Yorkshire specimens of the aggregate probably belong to *P. spinulosa* sensu stricto, but *P. killarniensis* is known from the county as follows: Twistleton Glen, Ingleton (64*), J. A. Paton and H. H. Birks, 1966. Paton (1979) has also described a new species, *P. brittanica*, of which one of the earliest gatherings was by Mr. F. E. Branson: old limestone quarry S. of Thornton Rust, Upper Wensleydale (65*), 1966.

Sphagnum recurvum. This species is now considered to comprise three varieties. The commonest is var. *mucronatum*, which is abundant in Yorkshire. Var. *amblyphyllum* is also known from all five vice-counties (see *Bull. Br. bryol. Soc.* **32**, 1978, 16, and add: boggy ground, Skell Gill, nr. Grantley, east of Ripon (64*), TLB, YNU Exc., June 1979). Var. *tenue* is known only from V.C. 65.

Campylopus pyriformis. Var. *azoricus* (see Corley, 1976) is probably widespread in Yorkshire. Corley reports it from V.C. 61 and 62 and it is also known from: boggy ground, Seckar Wood, Newmillerdam (63*), TLB, Mar. 1979; bog below Addlebrough, Wensleydale (65*), TLB, YNU Exc., July 1978.

Other interesting records are as follows. Those made during Y.N.U. Excursions, with the exception of V.C. records, are not included here since they are to be reported elsewhere.

Riccia sorocarpa: (63) 44/21 Arable field, Bullcliffe Wood nr. Stocksmoor Common, TLB, HLKW *et al.*, Nov. 1978; 44/22 Howden Clough, Morley, TLB, June 1979.

Fossombronia wondraczeckii: (63) 44/21 Arable field, Stocksmoor Common, TLB, HLKW *et al.*, Nov. 1978.

Bazzania trilobata: (63*) 34/93 Hardcastle Crags, J. Roberts, BBS Exc., Nov. 1978.

Jungermannia lanceolata: (64) 44/13 Shipley Glen, JA, 1953. The specimen was originally mistaken for *Plagiochila asplenioides*.

Mylia anomala: (63) 44/03 Howarth Moor, TLB, May 1979; 44/60 Hatfield Moor, BE, Mar. 1979, det. TLB.

Plagiochila tridenticulata: (65*) 34/68 Brackensgill, Dentdale, TLB, YNU Exc., Sept. 1979.

Odontoschisma sphagni: (63) 44/03 Howarth Moor, TLB, May 1979; 43/19 Upper Derwent Valley, TLB, Apr. 1979.

Scapania gracilis: (63*) 44/04 Sutton Clough, Glusburn, TLB, Oct. 1979.

Lejeunea lamacerina: (65*) 34/68 Helmside Gill and Brackensgill, Dentdale, TLB, YNU Exc., May and Sep. 1979.

Aphanolejeunea microscopica: (65*) 34/68 Brackensgill, Dentdale, TLB, YNU Exc., Sep. 1979.

Sphagnum tenellum: (63) 44/60 Hatfield Moor, BE, Apr. 1979, det. TLB.

Polytrichum commune var. *perigoniale:* (63*) 34/93 Widdup Gate, June 1860, Herb. W. Sutcliffe, Bankfield Museum, Halifax.

Ditrichum cylindricum: (62) 45/70 Esk banks, East Arnecliffe, TLB, Oct. 1978.

Dicranum tauricum: (63) 43/38 Loxley Valley, Sheffield, TLB, Apr. 1979.

Tortula marginata: (61*) 44/76 Stonework of old mill by R. Derwent, Howsham Hall, TLB, YNU Exc., Apr. 1979.

T. ruralis ssp. *ruraliformis:* (62*) sand dunes at Marske near Redcar, P. Robertson, 1978 (*Bull. Br. bryol. Soc.* **34**, 1979, 27).

Desmatodon cernuus: (63) 43/59 Spoil heap near Cadeby Viaduct, TLB, Aug. 1979.

Gyroweisia tenuis: (63) 44/31 Wall, Seckar Wood, Newmillerdam, TLB, Mar. 1979.

Weissia microstoma var. *brachycarpa:* (63*) 44/23 Muddy field, Cockersdale, TLB, May 1979.

Discelium nudum: (62) 45/70 Esk banks, East Arnecliffe, TLB, Oct. 1978. This is locally abundant in the S. Pennines, but there are few records from N.E. Yorkshire.

Pohlia bulbifera: (63) 34/90 Near Delph, TLB, Aug. 1979.

P. muyldermansii: (63*) 44/04 Soil in pasture, Sutton Clough near Glusburn, TLB, Oct. 1979. New to Yorkshire.

P. lutescens: (62*) 45/70 Esk banks, East Arnecliffe, TLB, Oct. 1978; (63*) 34/92 Greenwood Lee, Hebden Valley, MJW, BBS Exc., Nov. 1978; 44/21 Field by Stocksmoor Common, HLKW, Nov. 1978; 44/32 Royds Lane, Rothwell, TLB, Apr. 1979. New to Yorkshire.

P. lescuriana: (63*) 34/92 Greenwood Lee, Hebden Valley, TLB and MJW, BBS Exc., Nov. 1978. New to Yorkshire.

Plagiobryum zierii: (63*) 34/93 Hardcastle Crags, J. Needham, Apr. 1898. Given in Crossland (1904), but not in the Census Catalogue. There is good material in the Needham collection at Bankfield Museum, Halifax.

Bryum elegans: (65*) 34/68 Combe Scar, Dentdale, JR, YNU Exc., May 1979.

B. flaccidum: (65*) 34/78 Elm trunk, Flintergill, Dent, TLB, YNU Exc., Aug. 1979.

B. sauteri: (62*) 45/70 Esk banks, East Arnecliffe, TLB, Oct. 1978; (63*) 34/93 Cliff ledge, Hardcastle Crags, CP, BBS Exc., Nov. 1978; 44/23 Muddy field, Cockersdale, TLB, May 1979. New to Yorkshire.

Plagiomnium affine: (63*) 44/23 Woodland path, Cockersdale, TLB, May 1979; (65*) 34/78 Grassy wall-top east of Dent, TLB, YNU Exc., May 1979. This species has often been mis-recorded in the past.

Breutelia chrysocoma: (63*) 34/92 The Haven, Erringden, Roberts Leyland, *c.* 1840. Given in Baines (1840) and confirmed by Crossland (1904) but not in the Census Catalogue. There is a stem from Leyland's Herbarium in the Needham collection at Bankfield Museum, Halifax.

Orthotrichum sprucei: (62*) 45/80 Stones at water's edge, Esk banks, Grosmont, TLB, Oct. 1978.

O. affine: (63) 34/90 Wall top near Delph, TLB, Aug. 1979. An interesting record of a rather pollution sensitive species in the Greater Manchester area.

O. striatum: (65*) 34/68 On elder, Helmside, Dentdale, TLB, YNU Exc., May 1979.

O. stramineum: (65*) 34/78 On elm, Flintergill, Dent, TLB, YNU Exc., Aug. 1979.

O. pulchellum: (65*) On elder, West Lowfield, Kirkby Fleetham nr. Catterick, CP, 1978 (*Bull. Br. bryol. Soc.*, **34**, 1979, 31).

Amblystegium fluviatile: (63) 34/95 Stepping stones in R. Aire, Gargrave, TLB, Oct. 1979. First record for V.C. 63 this century.

Brachythecium mildeanum: (61*) Stone by water-filled gravel pit, Keyingham, JA, 1955 (*Bull. Br. bryol. Soc.*, **32**, 1978, 34).

Plagiothecium ruthei: (63) 44/40 Houghton Common, Grimethorpe, TLB, Apr. 1979.

Hypnum mammillatum: (63*) 34/92 and 34/93 Hebden Valley, 1859 and 1860, four packets in Herb. W. Sutcliffe, Bankfield Museum, Halifax.

The puzzling moss reported from the Y.N.U. Excursion at Newmillerdam in 1978 (*Naturalist*, 1979, 120) proved to be an attenuated form of *Pohlia nutans*, presumably induced by periodic flooding.

An asterisk indicates a new vice-county record or an amendment to the Census Catalogue. Recorders' initials: JA = J. Appleyard, TLB = T. L. Blockeel, BE = B. Eversham, CP = C. Preston, JR = J. Robertson, HLKW = H. L. K. Whitehouse, MJW = M. J. Wigginton.

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THE BRYOLOGY OF DENTDALE

T. L. BLOCKEEL

During 1979 Yorkshire bryologists were able to make two visits to Dentdale, one in May during the General Meeting of the Y.N.U., and the other during a sectional meeting from 30 August to 2 September. It has therefore been possible to form a good impression of the bryophyte flora of the area, which has received little attention in recent years.

The valley is particularly important for its extensive outcrops of Silurian strata, though the Yoredale limestone is present east of the Dent fault. Many of the early records were made by George Stabler, the Westmorland bryologist. In 1872 he recorded, among others, *Plagiochila spinulosa*, *Saccogyna viticulosa*, *Bazzania trilobata*, *Cololeueunea minutissima* and *Frullania fragilifolia*; in 1877 he found *Drepanolejeunea hamatifolia* in Brackensgill, here at the eastern limits of its British distribution. On a subsequent visit to collect more of the *Drepanolejeunea*, Stabler planted (presumably in Brackensgill) some Irish material of *Dumortiera hirsuta*, but the experiment was evidently unsuccessful as the plant has not been seen since. Another of Stabler's famous discoveries, which has never been refound, was *Habrodon perpusillus*, originally recorded in 1872 on an ash tree by the river and subsequently on sycamore nearby.

Y.N.U. Excursion, May 1979

A full report of localities visited will be published in the appropriate place, but there are a few late records which deserve mention. Miss Robertson collected *Bryum elegans* on Combe Scar, new to V.C. 65, and the *Andreaea* spp collected there have been named as *A. rupestris*, *A. crassinervia* and *A. rothii.* A *Plagiomnium* from a grassy wall top by the roadside east of Dent has proved to be *P. affine*, a much misrecorded species of which many old records refer to *P. elatum* or other species. This is the first confirmed record for the vice-county.

Bryological Section Meeting, 30 August — 2 September, 1979

On the morning of Friday 30 August, the party followed a track along South Lord's Land on the valley side west of the village. Bare soil on the track sides produced a number of small

mosses including *Bryum klinggraeffii.* Flushed banks by streams had *Pellia neesiana* and *Plagiomnium elatum* and from similar ground Mr. Grant collected *Leiocolea bantriensis* and *Breutelia chrysocoma.* Thus the influence of the underlying limestone was evident, although the rough pastures naturally had accumulations of peaty soil with *Sphagnum* patches, in one of which was *Polytrichum alpestre.* The limestone itself outcropped in the upper part of a gully and produced *Metzgeria pubescens*, *Ditrichum flexicaule*, *Seligeria pusilla* and *Rhytiadelphus triquetrus.* On a peaty bank in the same gully were *Ditrichum heteromallum* and *Lophozia incisa.*

The afternoon of the same day was spent in Flintergill, the substratum again being Yoredale limestone and shales. *Orthothecium intricatum* and *Cololejeunea calcarea* were on a shaded limestone outcrop and *Plagiochila asplenioides* was found with perianths. Though *Lejeunea ulicina* was on many trees, the epiphytic flora in general was not so rich as hoped; however *Frullania dilatata*, *Bryum flaccidum*, *Ulota crispa* var. *norvegica* and *Orthotrichum stramineum* were found on single trees, the last unrecorded in V.C. 65 since 1896.

The principal objective of the meeting was the exploration of the Brackensgill woods in the hope of rediscovering Stabler's *Drepanolejeunea*, and Saturday 1 September was devoted to this end. Brackensgill consists of a remarkable staircase of waterfalls on the Silurian escarpment west of Combe Scar. The adjacent woods are partly coniferized but the falls remain dark and humid, overhung with mountain ash and rhododendron. Here, by virtue of topography and the oceanic climate, bryophytes luxuriate in the variety and abundance associated with the Atlantic regions of Britain. Certain common species were particularly fine, including *Plagiochila asplenioides* var. *major*, *Dicranum majus*, *Hookeria lucens* and *Plagiothecium undulatum* (the last three all with fruit); but there were other, less widespread species — *Hylocomium brevirostre* on a bank, and *Bartramia pomiformis* and the handsome *B. hallerana* in rock clefts. However it is the rock faces, moist but not dripping in the humid atmosphere, that are the habitat of the delicate *Drepanolejeunea*; this was not in fact refound, but in its place was the related and equally minute *Aphanolejeunea microscopica*, a plant of similar ecology and distribution. It is the second Yorkshire record and the first for V.C. 65. It was seen twice, in one place associated with *Cololejeunea calcarea* (just as Stabler reported for his *Drepanoleunea*). *Plagiochila tridenticulata*, another oceanic hepatic new to V.C. 65, was found in a similar situation. Other records were *Saccogyna viticulosa*, *Scapania gracilis*, *Lejeunea lamacerina*, *Fissidens osmundoides* and, on logs, *Nowellia curvifolia.*

After the arduous climb up the ladder of waterfalls and a skirmish with a rhododendron thicket, the writer emerged onto a more open area above the woods. Here in several places was *Rhabdoweisia crispata* in rock crevices, and *Dicranum fuscescens.* An isolated waterfall had some wet rock faces clothed with beech fern; the bryophytes included *Plagiochila spinulosa* c. per., robust *Breutelia chrysocoma*, and a form of *Tortella tortuosa* with elongate cells overlying the nerve. On a heathery tussock in boggy ground nearby was made another notable find, the hepatic *Anastrepta orcadensis.* Rocks above this boggy area had *Andreaea rupestris* and *A. crassinervia*, but these seemed very localized in distribution and were not seen on many similar outcrops. Runnels on an irrigated slope in the same area had *Scorpidium scorpioides* and *Calliergon giganteum.*

A short visit to the Dee banks near Gawthrop produced *Tortula latifolia* and *Orthotrichum sprucei* on tree bases. A further stretch of this part of the river was examined on Sunday 2 September. *Schistidium alpicola* was on stones by the water and *Orthotrichum affine*, *Zygodon viridissimus* var. *viridissimus* and *Anomodon viticulosus* were found as epiphytes. At Helmside, the elm on which *Orthotrichum lyellii* had been seen in May was relocated, but more abundant and robust material was found by Mr. Branson on a nearby sycamore.

The Bryology of Dentdale

Dentdale is notable in the Yorkshire context for the occurrence of Oceanic bryophytes. This is to be attributed both to its westerly position and to the outcrops of Silurian slate (it is well-known that limestone is not a substratum suited to the majority of Atlantic bryophytes). The

valley has affinities with the Lake District and indeed its flora is an outlier of the flora of that district. While there are many Lakes species which do not extent so far east as Yorkshire, the Oceanic species in Dentdale (notably *Anastrepta orcadensis*, *Bazzania tricrenata*, *Plagiochila tridenticulata* and *Aphanolejeunea microscopica*) form a significant element of the flora.

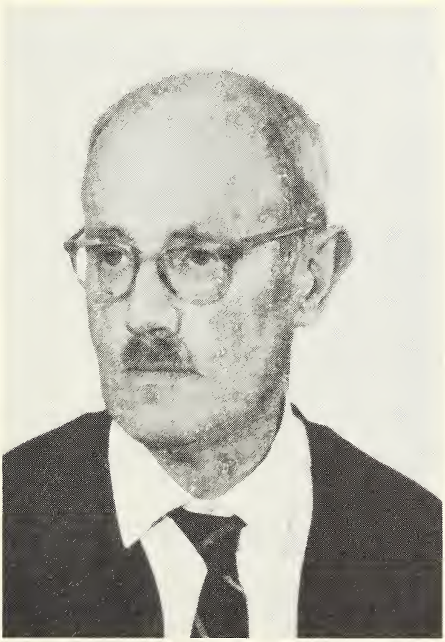
The epiphytic flora is also richer than in many parts of the county. There has certainly been some deterioration brought about by atmospheric pollution carried from the industrial south. *Ulota* is now very rare, and *Cololejeunea minutissima* and *Habrodon perpusillus* have not been seen since Stabler's day; however *Lejeunea ulicina* is still abundant in suitable gills, and *Orthotrichum* is well represented, three of the species being ones formerly common in the county but now very rarely seen (*O. lyellii*, *O. striatum* and *O. stramineum*).

Two-hundred-and-twenty-two bryophytes were seen during the two meetings.

ACKNOWLEDGEMENTS

I wish to thank Mr. and Mrs. R. Frankland for permission to visit the Brackensgill woods, Mr. G. A. Shaw for references to Stabler's early records, and Miss J. Robertson and Messrs. F. E. Branson, D. R. Grant and E. Thompson for their help at the meetings.

GEORGE ALLAN SHAW
1916–80



George Allan Shaw was born in Shipley on 12 April 1916. He was educated at the Salt Grammar School, Shipley and after leaving school he first learnt and then taught shorthand and typing at Fox's School of Commerce in Bradford. His interest in botany developed at an early age and when eighteen years old he joined the Bradford Naturalists' Society. He remained an active member of the Society for the rest of his life, serving it as recorder for botany and bryology and in other capacities before becoming its President.

Two men influenced Shaw's development as a naturalist more than any others. During the early years of membership of his local Society, Malins Smith, who was Head of the Biology Department at the Bradford Technical College, a pillar of the Bradford Naturalists' Society and one of the most prominent members of the Botanical Section of the Yorkshire Naturalists' Union, was largely instrumental in encouraging Shaw's growing interests and then in drawing him into Y.N.U. activities. His debt to Malins Smith's helpfulness is well expressed in the obituary notice which he wrote of him. He had not long been an active participant in Y.N.U. field meetings before he fell under the spell of Chris Cheetham's inimitable personality. It was doubtless Cheetham, for whom he had a great admiration, who fired his enthusiasm for bryology.

Shaw had joined the Y.N.U. in 1938 and the following year his first publication in *The Naturalist* appeared. This was a field note (*Nat.* 1939: 213) in which he recorded his rediscovery of *Carex capillaris* in Gordale, in William West's original station. By 1948, after the break for war service overseas, he had become an active member of the Bryological Section and his devotion to the interests and activities of this section which he had represented on the Executive of the Union since 1956 and of which he was Vice-Chairman since 1968, endured for the rest of his life. For thirty years he was a frequent contributor to *The Naturalist* of short articles, records and excursion reports for both flowering plants and bryophytes, and for nine years was responsible for the annual bryological report. Probably his most enduring contribution to Yorkshire bryology was the preparation and publication of a comprehensive and invaluable index to bryological records and bryologists, extracted from *The Naturalist* and covering a century of observations and reports from 1875 to 1975.

Shaw's appointment as President of the Union in 1972 was a well-deserved recognition both of his standing as a bryologist and of his many services to the Union. For seventeen years he had acted as Assistant Honorary Treasurer and Membership Secretary, one of the most exacting but least glamorous of all administrative appointments. Blending patience and persistence with persuasiveness and tact he diligently pursued all defaulting members and few escaped his net. He also undertook for over twenty years the dull task of compiling the annual index to *The Naturalist.* His services in these and other capacities sprang from a deep loyalty to the Union. Its well-being and prestige were matters of real concern to him. Few members were better informed about the past history of the Union. He had acquired that rare possession — a complete run of *The Naturalist* — and he also had what is probably the most complete set in existence of Y.N.U. excursion circulars. The contents of both were well studied. His excavations into the past found expression in the publication from time to time of notes or articles relating to past events or former members. A good example is his amusing contribution to our centenary issue (*Nat.* 1975: 115–16) on 'The Good Old Days', wherein are recorded some of the more unusual or bizarre happenings at past Y.N.U. gatherings as recorded in old volumes of our journal. At meetings following field excursions he would occasionally produce a circular relating to a field meeting held long ago at the same place. The arrangements made for our Victorian or Edwardian forbears make interesting comparisons with present-day procedures; they also often raise unintended smiles. Such items are fragments of our social history, preserved like fossils in the archives of the Union.

During the war Shaw served in the Royal Corps of Signals and was successively stationed in Malta, Egypt and Turkey. He was in Malta at the time of the fierce assault on that island by the German Luftwaffe. I recall Malins Smith telling me at that time that he periodically heard from Shaw and that his letters were full of the plants he had been finding in Malta. The bombs were not mentioned. He doubtless regarded these as other botanists might regard mosquitoes, as an unavoidable irritant to be put up with during the pursuit of one's interests.

After demobilization, being wishful of combining his botanical interests with his career, Shaw became a member of the technical staff of the Botany Department at Bangor University. A few years later he transferred to Leeds University and for the rest of his life he served the Botany Department at Leeds with the same conscientiousness which he brought to all he did. His knowledge of systematics was invaluable, for he usually knew where to lay his hands on whatever living material might be required for class work. In recent years much of his time was given to curating the Department's considerable collections. For this work and all

the other unobtrusive ways in which he contributed to the smooth running of the Department as well as for his personal qualities he will be much missed by his colleagues on both the technical and academic staffs.

George Shaw had a retiring disposition and was one of the most undemonstrative of men. He shunned publicity and preferred to take a back seat at meetings and leave others to do the talking. He seldom expressed his opinions unless they were sought. His greatest pleasures lay in the countryside (he was a Life Member of the Youth Hostels Association) and the Yorkshire countryside was foremost in his affection for he was steeped in the history of its botanical investigation. He did not allow the lameness which afflicted him for so many years to prevent him from taking part in excursions and he never complained about his disability. Though his shyness and reserve might at first make him appear to some to be uncommunicative or unresponsive, all who came to know him came to respect him. The large number of friends and colleagues who assembled at his funeral service was an indication of the high regard in which he was held. George Shaw will be missed by many friends but his memory will endure with them. Our sympathy goes to his wife who shared many of his outdoor interests, and to his son.

WAS

THUIDIUM RECOGNITUM (HEDW.) LINDB. IN YORKSHIRE

G. A. SHAW

Thuidium recognitum has been much misunderstood in the past and has often been confused with both *T. delicatulum* and *T. philiberti*. In the early days the importance of the disposition of the papillae on the paraphyllia was not known. These are well illustrated in Dr. A. J. E. Smith's new Moss Flora.

I have recently examined all available Yorkshire material, and practically all have been confirmed by the B.B.S. referee, Mr. E. C. Wallace, to whom my best thanks are due.

T. recognitum has been noted from:

1. Colt Park, Ribblehead V.C. 64, Cheetham, Sept. 1946 (Herb. Leeds University)
2. Oxenber, Austwick V.C. 64, Cheetham, Feb. 1915 and Feb. 1948 (Herb. Leeds University)
3. Trow Gill, Clapham V.C. 64, Cheetham, April 1915; Shaw, April 1947 (both in Herb. Leeds University)
4. Ingleton Ghylls V.C. 64, Nowell, June 1861 (Bradford Museums);
   do., Wm. Sutcliffe, 1 June 1861 (Halifax Museums);
   do., Cheetham, Sept. 1946 (Herb. Leeds University)
5. Austwick V.C. 64, Cheetham 1915 (Herb. Leeds University)
6. Hartlington Gill, Appletreewick V.C. 64, Cheetham 1915 (Herb. Leeds University)
7. Mackershaw, nr. Ripon V.C. 64, Wallace 1943 (Herb. Wallace)

It will thus be seen that all the localities are in V.C. 64, and all are on the mountain limestone with the exception of Mackershaw, which is on the Permian.

The first bryologist to collect this species at Ingleton was probably William Wilson. Through the kindness of Mr. Tom Blockeel I have also examined a specimen from Helk's Wood, Ingleton, from the collection of William Sutcliffe of Heptonstall, dated 1 June 1861; and by the kindness of Miss M. M. Hartley, of the Bradford Museums, a specimen of John Nowell's, also from Helk's Wood, Ingleton, dated June 1861. Sutcliffe lived at Heptonstall and Nowell at Todmorden, and it seems possible that in view of the two dates they were botanizing at Ingleton together. On the other hand, Mr. Blockeel rather inclines to the view that Nowell simply gave a specimen to Sutcliffe.

The following, previously referred to *T. recognitum*, are now corrected:

Ingleton, V.C. 64, Webster 1895, is *T. delicatulum* (Herb. Leeds University)
Simon Fell, V.C. 64, Haxby 1911, is *T. philiberti* (Herb. Leeds University)
Grass Wood, V.C. 64, Cheetham 1946, is *T. delicatulum* (Herb. Leeds University)
Feizor Nick, V.C. 64, Cheetham 1946, is *T. delicatulum* (Herb. Leeds University)
Hornsea Mere, V.C. 61, Cheetham 1935, is *T. delicatulum* (Herb. Leeds University)

It may be noted that the last-named specimen, from Hornsea Mere, is the first record of *T. delicatulum* for V.C. 61, and a voucher has been sent to the B.B.S. Recorder.

The above represents the distribution of *T. recognitum* as known to me, but information on any further localities would be most welcome.

BOOK REVIEWS

Mammal Photography and Observation. A Practical Field Guide by **L. J. Warner**. Pp. 244, with 176 black and white illustrations. Academic Press. 1979. £4.95

The book is divided into two main sections. The first deals with techniques with the reader introduced to all the relevant topics pertaining to the photographing of mammals in the wild. These include choice of camera, lenses, flash photography, nocturnal aids, clothing, hides, stalking, traps, and so forth. The second section considers the techniques appropriate for particular species of British mammal. This is a very full account with a chapter devoted to pretty well every species of wild mammal including the much less common species as pine marten, wildcat, reindeer, and even wallaby. The account is illustrated with many of the author's excellent photographs.

The great virtue of this account is that the author is writing against the background of considerable knowledge and experience. His helpful tips and guidance will be appreciated by all photographers of wildlife from the novice to the expert, while his simple and lucid presentation may well stimulate those who have not yet embarked on this fascinating hobby. This is a commendable account at a modest price.

MJD

Arctic Summer. Birds in North Norway by **Richard Vaughan**. Pp. 152. Anthony Nelson. 1979. £6.25

Following the publication of his *Birds of the Yorkshire Coast*, Richard Vaughan takes us, in his latest book, on a journey of ornithological exploration of one of Norway's most northerly peninsulas — Varanger Peninsula. The author wisely confines the details of the journey, and a comprehensive account of the area to the opening chapters. The remaining chapters describe his encounters with the main groups of birds to be found. Each chapter closes with an illustrative selection of photographs. The colour photographs are of high quality, but unfortunately few in number. The majority of the black and white illustrations — perhaps due to the quality of the paper on which they are printed — frequently lack clarity and definition, although evocative of the harshness of the arctic world. The book contains two simple sketch maps, a useful bibliography and a systematic list which gives not only the Norwegian name, in addition to the Latin and English names, but also an appraisal of the present status.

Those wishing to follow in Dr Vaughan's footsteps will find the book full of interest and useful information.

HTJ

THE USE OF MAN-MADE POOLS BY DIVING DUCKS AND TERNS OFF MORECAMBE, LANCASHIRE

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The littoral zone off the West End of Morecambe is fairly typical of the southern end of Morecambe Bay in that it consists of mud interspersed with 'skears' of pebbles on which extensive mussel beds *Mytilus edulis* have formed. Additionally there are two man-made structures of importance, namely a paddling and boating pool and a fenced-off area which was constructed to create small pools which slowly empty into fish traps as each tide recedes. The paddling pool is built onto the beach against the sea wall and ranges in depth between zero at the landward edge to about 2.5 m at the seaward edge. It is filled by the first high tide after drainage. The fish trap is about 100 m offshore and encloses an area of mussel bed about 50 m square. At both sites the most common fish species is the sprat *Clupea sprattus*.

On 12 February 1978 I noticed a female Goldeneye *Bucephala clangula* on the paddling pool. This bird was to remain there, apparently continuously, for ten days. On 16 February eight dives were timed to give an average submergence time of 22.1 sec. The following year on 16 March a female Goldeneye appeared on the pool and was seen to dive seven times in 210 sec with an average submergence time (four dives) of 20.1 sec.

During 1978 and the first half of 1979 I saw fourteen Red-breasted Mergansers *Mergus serrator* on the paddling pool: one female and three males on 11 January 1978, one female on on 22 January 1978, two females on 12 February 1978, one female on 23–24 February 1978, two females and two males on 20 December 1978 and two males and one female on 16 September 1979. On 20 December 1978, the four birds arrived in two pairs at least twenty minutes apart. For most of the time the pairs remained separate, but each bird remained close to its partner. One pair was observed closely and were found to synchronize their dives to within 1 sec, except on one occasion (out of twelve) when the male dived for 5 sec and the female remained on the surface. Table 1 shows the timing of twelve pairs of dives. The diving rate was five dives per minute (timed over fifteen minutes) for both sexes. The difference between means is not significant. The average difference between submergence times was 3.8 sec indicating that resurfacing is not synchronized.

TABLE 1

Submergence times (in seconds) of a pair of Red-breasted Mergansers during simultaneous diving

Dive	1	2	3	4	5	6	7	8	9	10	11	12	av.
Male	5	15	7	15	8	7	8	3	5	14	3	12	8.5
Female	10	14	10	6	3	8	7	6	—	10	8	7	8.1

Diving ducks occur frequently on the fish-trap pools in winter; the large rafts of Goldeneye which can be seen inshore at high tide disperse along the coast between Morecambe and Heysham and small numbers forage in the trap pools. Very small numbers of Red-breasted Merganser summered there in 1978, one pair staying from 25 May to at least 18 June when I temporarily left the area. The most interesting use to which the pools were put took place on 24 February 1979. This was one of the first fine days after an exceptionally harsh spell and at low tide about fifty Goldeneye were spaced out over the pools. Sometimes small aggregates of birds formed and when the ratio of males to females was high vigorous sexual display took place. Immature males were also displaying although this had no discernable effect on the females. The following day at high tide the birds were in a raft near the pools and no sexual display took place although the weather was fine. Goldeneyes, when feeding at the trap

pools, always dived over mussels when these were covered, but dived regularly over mud when the mussel beds were dry. The only other ducks noted at the fish trap were an immature male Eider *Somateria mollissima* and two male and three female Long-tailed Duck *Clangula hyemalis* on 25 May 1978 and 25 February 1979 respectively. The Eider was not seen to feed but the Long-tailed Ducks dived frequently over mud.

During the summer the paddling pool is occasionally visited by Common Terns *Sterna hirundo*, but only in any numbers around dusk, owing to the considerable human disturbance there during the day. The most notable gathering during 1978 or 1979 was one of forty birds on 5 June 1979 at sunset. Two Sandwich Terns *S. sandvicensis* were also present. These are comparatively uncommon along this part of the coast, especially outside the migration periods. At all times of the day Common Terns could be seen at the fish trap. Numbers varied principally with the state of the tide, no terns being seen when the traps were covered by the sea, and maximum numbers (usually around 200) occurring immediately after the tide had receded past the trap. Observations were carried out at very close range and it was possible to identify the prey taken and to assess the bird's diving success rate. In all cases observed (about 1000) sprats were taken, usually ranging in length between about 8 cm and 15 cm; one specimen about 25 cm long was caught, but after a struggle it was dropped and not retrieved. Nine fish were dropped close to me and of these seven were eventually capable of swimming away. Diving success was highest around midday, decreasing towards 1800 h and increasing towards sunset. These observations (made between 28 May and 3 June 1978 at the same state of tide relative to the traps) suggest that diving success was related to a function of solar elevation and, perhaps, ambient light intensity. Where possible wind and sea conditions were the same at each observation. Dunn (1973) showed that success depended on wind and sea conditions but not cloud cover (which was not constant during this study). Solar elevation was apparently not taken into account. Fig 1

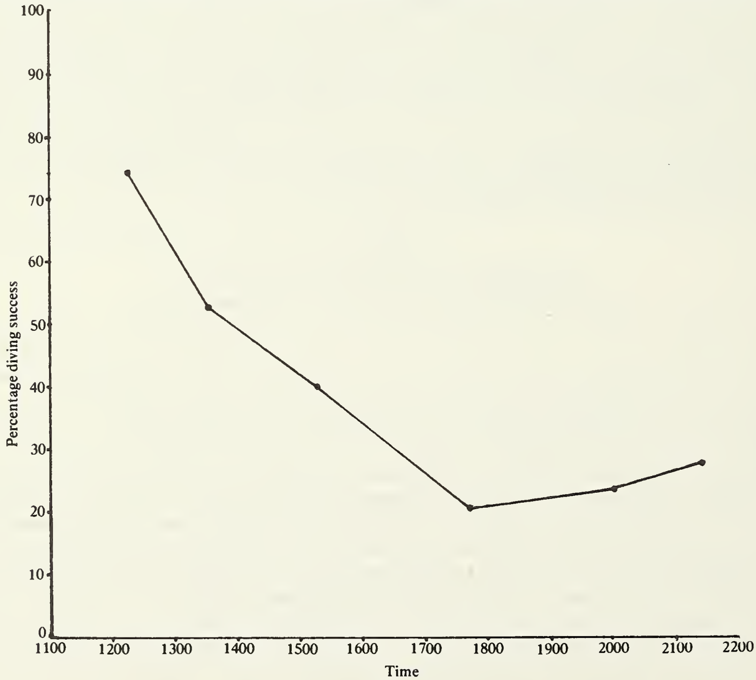

FIGURE 1
Diurnal variation in diving success of Common Terns at Morecambe fish-traps.

gives the results obtained from these observations. The only other tern species seen at the traps were one each of Little *S. albifrons* and Black *Chlidonias niger* on 25 May and 31 May 1978 respectively.

Generally, ducks made use of the man-made pools during periods of high pressure or strong off-shore winds, conditions under which the pools were exceptionally calm compared with the open sea. The density of fish in the pools was appreciably higher than outside. For the terns, the ease with which fish could be caught at the trap clearly made the 8 km round trip to and from the colony worthwhile, for as well as feeding themselves, they could be seen taking fish overland to the marsh on which they breed. It is therefore possible that the fish trap pools are an important factor in the success of the colony.

REFERENCE

Dunn, E. K. (1973) Changes in fishing ability of terns associated with windspeed and sea surface conditions. *Nature*, **244**: 520–1.

THE MINING SOCIAL BEE, *LASIOGLOSSUM CALCEATUM* (SCOPOLI) (HYMENOPTERA: HALICTIDAE) IN DALLOWGILL, YORKSHIRE

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On the morning of 7 July 1979 at the Yorkshire Naturalists' Union's field meeting in Dallowgill (SE/1971), I was fortunate to find and excavate two nests of the mining bee *Lasioglossum calceatum*. The nests were in a path just outside the woodland so that the soil around the nests would be warmed by the sun for a part of each day. The nest entrances were open but each was surrounded by a mound of excavated soil.

This bee, unlike most mining bees which are solitary, has developed social habits very similar to those of the bumblebee (Michener, 1974). The overwintered queen emerges in the spring and excavates a burrow, builds about five cells, provisions each with a pollen ball, lays an egg and closes each cell. The adults of this first brood emerge from the end of June through July and are all females, slightly smaller than their mother. These smaller females behave like workers and raise a second brood from eggs supplied by their mother or the queen. The second brood starts to emerge from early August and consists of males and females; these females are the same size as the mother queen and are the future queens. The new queens mate and enter hibernation to emerge the following spring. The mother queen, workers and males die by the autumn.

The burrow of the first nest I looked at descended along the side of a stone for 40 mm, then turned through a right-angle, opening into a horizontal cavity (length 40 mm, width 13 mm, depth 19 mm). The cavity contained a number of contiguous cells which were so fragile that they collapsed into several pieces when being removed. From the fragments it was possible to discern the cylindrical shaped cells which were slightly wider at one end (dimensions — length 11 mm, diameter 7 mm). The interior walls of the cells were polished except at the narrow end, where there was either an entrance or a plug of soil. One pupa, three mature larvae without black gut contents, six mature larvae with black gut contents and with no or a very small pollen ball, one young larva with a small pollen ball and three complete pollen balls were found, indicating that at least fourteen cells were present. In the cells containing the pupa or mature larvae without gut contents, the gut contents (meconia) were found flattened against the wall of the broader end of the cell. The pollen ball, when present, was also located at the broader end of the cell. Two adults were found. One was slightly larger and had a more worn appearance, ie fewer hairs were present on the top of the thorax (mesoscutum) and the wing margins were more tattered.

The second burrow descended along the side of a stone for 83 mm, traversed around the stone before opening into a cavity (length 50 mm, width and depth 13 mm). Two mature

larvae without gut contents, two mature larvae with gut contents, six young larvae and two complete pollen balls were found, indicating that at least twelve cells were present. Again, two adults, one slightly larger and more worn than the other, were present.

Michener (1974) raised two problems concerning the details of the life-history of *L. calceatum*:

1. Are the cells first excavated and then a cavity formed around them or is a cavity first excavated and the cells constructed in the cavity? A stone (average diameter 7 mm) was found lodged between two cells while cell walls varied greatly in thickness (0.6–2.4 mm). Sometimes the cell wall separating two cells was as little as 1 mm thick. These observations would tend to support the hypothesis that excavation of the cells occurs first, followed by cavity formation.
2. Are the development of the first and second broods discontinuous or continuous with each other? The larger worn female in each nest would be the older individual and hence the queen, and the second individual a worker of the first brood. The large number of cells present in each nest compared with the known average number indicates that the rearing of the second brood has started. The presence of all pre-adult stages also indicates that the development of the first and second broods is continuous.

Other aculeate bees and wasps collected in Dallowgill were:

A worker *Bombus pratorum* (L.) taken on foxglove, a queen *B. lucorum magnus* Vogt, which some authorities regard as a separate species from *B. lucorum* (L.), workers of the social wasps *Vespula rufa* (L.) and *Dolichovespula norwegica* (Fab.) and the solitary wasp *Chrysis ruddii* Shuckard.

In the afternoon the YNU party moved to Skell Gill (SE/2069) where I found workers of *Bombus monticola* Smith (= *B. lapponicus* misident.), *B. lucorum* (L.) on ground elder, and *Dolichovespula sylvestris* (Scopoli) collecting prey associated with ground elder; the females of solitary bees *Andrena nigroaenea* (Kirby), *A. haemorrhoea* (Fab.) on ground elder, *A. jacobi* Perkins, *A. cineraria* (L.), *Nomada fabriciana* (L.), *N. goodeniana* (Kirby) and *Sphecodes crassus* Thomson (although a male of the latter species needs to be taken to be sure of identification).

REFERENCE

Michener, C. D. (1974) *The Social Behaviour of the Bees.* Belknap Press of Harvard University Press, Cambridge, Mass.

ASKHAM BOG*

W. A. SLEDGE

Askham Bog is the jewel in the crown of the Yorkshire Naturalists' Trust. Botanically and entomologically it ranks amongst the foremost reserves of its kind in the country. Its preservation therefore is a matter of increasing scientific importance as drainage and destruction of wetland habitats throughout Britain progressively impoverish or eliminate the distinctive flora and fauna of this type of environment.

For well over a century naturalists from Yorkshire and further afield have gone to Askham Bog to pursue their hobby and to delight in its richness, in much the same spirit as others, attracted by a different facet of our national heritage, have gone to York Minster. A century ago a series of articles on the Bog appeared in the Quaker school *Natural History Journal* and it is to commemorate the centenary of this that the present book has been produced. The surprising fact perhaps is that a locality which has been so justly famous for so long should have had to wait until now for an adequate description of its history, present ecology and features of special interest in the chief plant and animal groups.

*A WOOD IN ASCAM: a study in wetland conservation. Edited by ALASTAIR FITTER and CLIFFORD SMITH. Pp. viii + 164, with 4 monochrome plates and 23 figures. Sessions, York. £4.95

The history of the Bog as reconstructed from its stratigraphy shows the usual sequence of successions from open water to raised bog. Its subsequent history was changed by peat cutting which led after its abandonment to reversion to fen. The cutting of peat was practised probably for not less than 150 years and terminated about the middle of the eighteenth century or soon thereafter. The more recent history is covered in progressively increasing detail by maps and by written records or preserved specimens made by visiting naturalists.

Within the Bog there are marked differences in the vegetation of different parts and the factors which determine these differences are examined and the mosaic of plant communities throughout the reserve are described in detail. These range from acid and species-poor parts to the base-rich and floristically diversified fen vegetation of the Far Wood.

This is the most analytical account of the plant ecology of Askham Bog which has so far been published. Understanding the past history and present ecological balance also provide the basis for foreseeing future trends and hence of taking such steps as are necessary to arrest changes in undesired directions. Here the management committee is faced with difficulties since its requirements are sometimes in conflict with those who control the surrounding land, as in the preservation of a high water table within the Bog in the face of pressures to improve drainage in the adjoining fields. The problems of management are dealt with in a concluding chapter and one can only hope that the struggle for the preservation of the Bog will find increasingly strong and effective support at national as well as local conservation levels.

The majority of visitors to the Bog are probably amateur naturalists whose interests lie primarily in systematics. There are chapters dealing with the flora, entomology, conchology and vertebrate zoology in which the salient features of interest for each group are described with comments on changes which have occurred over the years. These accounts are supplemented by a series of appendices wherein complete lists are given of all recorded species in fourteen different groups and these species lists have been compiled from the most authoritative sources available. There are at least some notable species at the Bog in all the invertebrate groups whilst in some, and especially the water beetles, the reserve has long been famous for the rarities and otherwise notable species which it harboured. But it makes sad reading to find how many former inhabitants are now no longer to be found. Six butterflies have gone; eight caddisflies, which represent 35 per cent of the total number recorded; and of nineteen species of freshwater molluscs recorded in 1879 only four can now be found. Part of this impoverishment is due to the disappearance of Chandler's Whin ponds and partly to pollution of the dykes on the northern and eastern sides of the reserve.

Botanists who knew the Bog in pre-war days will be all too well aware of the virtual destruction of the rich flora which formerly characterized the marshy, base-rich meadows and dyke margins fringing the south sides of Middle Wood and Far Wood. A high proportion of the species which are no longer to be found grew here. My own recollections go back to the early 1920s when this area was so productive that its investigation was apt to delay the visitor overlong from sampling the Bog proper. It seems only a matter of time before the golfers give the *coup de grâce* to the surviving fragments of this once splendid flora. Inside the Bog most of the notable species recorded during the last century still persist. The autecology of two species, *Hottonia palustris* and *Carex elongata* have been studied in some detail and the findings are recorded. The facts about the history of *Carex elongata* at Askham however have been overlooked. It was first found there by B. B. Le Tall the Bootham schoolmaster in 1892 and his record was published in the *Natural History Journal* for that year. Shortly afterwards Le Tall left England for a post in Tasmania and where he had found the *Carex* was unknown to contemporary botanists. It was to Le Tall's record that Wilkinson was referring in the YNU circular to which reference is made in this account. The plant was not refound at Askham until 1936 and the facts are recorded in *The Naturalist* 1936, pp 231–2, and in the *Supplement to the Yorkshire Floras.* The latter work does not appear to have been referred to and other plant records could have been included had it been consulted.

Naturalists in general, and Yorkshire naturalists in particular, will welcome this book for it brings together a mass of information about a reserve of great natural history interest and of considerable scientific importance. Those with long memories will have their pleasure in

its contents somewhat modified by nostalgic regrets that surrounding areas which were once so productive have now disappeared. But it is heartening to know that the future of the Bog is assured and that the constructive plans of the management committee include measures designed to encourage the return of insects and other species by providing habitats within the reserve similar to those that were lost when Chandler's Whin ponds and the Flat Swamp were destroyed. The authors deserve thanks for the thoroughly competent manner in which they have dealt with their task both in the planning and execution of the work and not least in the careful proofreading. English and scientific names are given for all the listed species in the appendices and with over 2000 Latin names to check the number of printer's errors which have escaped detection is very small. The book is well produced and the photographs, charts, tables, and text figures give added interest to the text. It is appropriate that the centenary which the book was planned to commemorate should also coincide with the year when its senior author is President-elect of the Yorkshire Naturalists' Union.

BOOK REVIEWS

A Life of Invertebrates by **W. D. Russell-Hunter**. Pp. xviii + 650, with many line drawings and plates. Collier Macmillan. 1979. £12.75

This survey of invertebrates is made from morphological, physiological, ecological, and evolutionary standpoints. It is essentially a textbook and will be of particular value to undergraduate students, but naturalists will find much to interest them, particularly aspects of physiological-ecology and adaptive behaviour.

Invertebrate Animals: Collection and Preservation compiled by **Roger J. Lincoln** and **J. Gordon Sheals**. Pp. viii + 150, with numerous illustrations. British Museum (Natural History)/Cambridge University Press. 1979. £9 hardback, £2.95 paperback

Detailed information on the collection and preservation of each invertebrate group (with the exception of insects) is provided together with basic notes on their morphology and classification. Other sections deal with collecting equipment and field techniques, recipes for killing, fixing and preserving, and the general treatment of collections.

Carnivores of Europe by **Robert Burton.** Pp. 173 with 12 colour plates, 12 black and white plates and 24 line drawings. Batsford. 1979. £8.50

This book is one of few general accounts of the biology, ecology and distribution of the carnivores of Europe and on this score alone is to be welcomed. This Order of mammals has been particularly subject to man's adverse influence so that an appraisal of its status at the present time is most appropriate.

The author introduces the reader to the general characters of the carnivores and then goes on to provide a brief description of the families occurring in Europe and a more detailed account of each species. These are frequently accompanied by distribution maps.

Although the author has obtained his information from a wide range of sources, it is quite evident that for some species, e.g. raccoon dog, beech marten, wolverine, the available scientific data are very scant. For some species, e.g. badger, weasel, there is considerable dependence on the British literature and one wonders whether this accurately reflects the balance of work undertaken on these animals. While there is much information on the ecology of badger, the reader is given little advice on its status in continental Europe.

The photographs, particularly those in colour, are of a high standard and the line drawings are clear and of reasonable size. The text on each species could have been helped by the introduction of sub-headings as this would have organized the information more systematically. This is a useful book and one to be recommended to anyone wishing to widen their knowledge of these interesting mammals.

MJD

Lambert's Birds of Shore and Estuary by **Alan Mitchell**, with paintings by **Terence Lambert.** Pp. 128, almost half of which are colour plates. Collins. 1979. £6.95

This is the second book produced by the collaboration of these two ornithologists. Despite the occasional over-exaggerated posture the paintings of birds by Terence Lambert are immaculate; too perfect, perhaps, for many. Wide use has been made of plants, rocks and other habitat elements to produce a series of harmonious if rather stylized ornithological ensembles, reminiscent of the approach of John Gould in the last century.

The text is clearly aimed at the uninitiated, but does contain much up-to-date information on the habits, habitat and distribution of the birds illustrated.

A nice gift for the not too interested birdwatcher.

MD

Problems of Genetics by **William Bateson**, with an Historical Introduction by G. Evelyn Hutchinson and Stan Rachootin. Pp. xxii + 258, with 14 figures (line drawings, photographs, and 1 colour plate). Yale University Press. 1979. £12.30 hardback, £3.15 paperback

William Bateson's *Problems of Genetics* was first published in 1913 when the concord between Darwinian theory and factorial inheritance had but recently been established. It was written at a time when the inheritance of acquired characteristics seemed probable to many, when the gene and its action were inscrutable, and before the role of chromosomes in inheritance was recognized by all biologists.

This is a book for biologists. It is unlikely to be appreciated fully by students or even by young researchers faced, as they are, by a torrent of more recent work. However, the significance of the courteous exchange of letters between Bateson and Kammerer would be clear to anyone who saw the BBC Television play entitled *The Case of the Midwife Toad*: Kammerer failed to produce specimens of the toad with nuptual pads to support his contention that such characters could be acquired and inherited. Topics discussed in the book include the species problem, mutation, local variation and differentiation, hybrid sterility, meristic phenomena, and segmentation. Attempts to reconcile the problems posed by Bateson with a current appreciation of genetics proved to be an exhausting process for the reviewer. The Historical Introduction is interesting, but was of little help in this personal appraisal.

The book is to be recommended to those with an interest in biological perspectives and a sound knowledge of modern genetics.

DJH

Zoological Illustration: An Essay Towards a History of Printed Zoological Pictures by **David Knight**. Pp. 204, with black and white illustrations. Archon Books, Connecticut. 1977. £10

This excellent book is a scholarly account of the part that illustrations have played in the development of zoology and especially their reflection of the history of that discipline. The book is divided into three major categories, the purpose and techniques of zoological illustration, and an historical account of these illustrations from the mid-sixteenth century through to modern times. In addition, the author explains the various methods used to illustrate books, the way that developments in printing have affected the techniques used by artists and engravers, and the changes in engraving and artistic methods which have developed independently of the printer.

Dr Knight points out that illustrations viewed within the context of a book show that the artist was 'working for a certain author and sort of book, for a certain publisher and public, at a certain price, and at a certain time', something that needed saying as too often books of an earlier period are judged against the standards of the twentieth century. With this in mind it is not appropriate to comment on the absence in this book of coloured plates: one must accept that their inclusion even in small numbers could have doubled the price. However, the printing of this book on paper so thin that the type shows through every page cannot be a justifiable economy.

It is sad to find fault with such an otherwise excellent book but I find the index unsatisfactory and the inclusion of so-called bibliographies at the end of each chapter rather than as a whole render it difficult to use as a reference work, which is what the text richly merits.

AW

The Alpine Flowers of Britain and Europe, text and black and white illustrations by **Christopher Grey-Wilson**, colour illustrations by **Marjorie Blamey**. Pp. 384, including illustrations, maps and line drawings. Collins. 1979. £5.95 hardback, £4.50 paperback

Covering the Alps, Pyrénées and Apennines and the mountains of central France, Germany, Britain, and Scandinavia, this attractive handbook should prove a most useful guide to those botanizing in these areas: fortunately, its compact format will enable it to be tucked into holiday luggage without difficulty. Alpine flowers are here defined as all those growing above 1000 metres, many of which, of course, will also be found growing at lower levels. The majority of the excellent illustrations are in colour; many are life-size, the remainder showing a single life-size flower of the plant in question. Variants from the norm are described in the text, which concentrates on those features most useful for rapid identification and those not easily ascertainable from the illustrations alone. Pictorial keys, based on flower shape and colour, are specifically designed for those without specialist knowledge. Designed to be easily carried, users are very rightly urged to take the book to the plant and refrain from picking specimens to identify.

Understandably, grasses and sedges are excluded; less understandably, so are bushes, although trees are included: in an Alpine habitat, where does one draw the line between trees and bushes? However, the text does include such species as the bramble, rose, cotoneaster, broom, gorse, daphne, dogwood, and lavender, and there is a leaf-shape key (Appendix 3) which includes large shrubs as well as trees. A series of useful appendices provide further guidance to the more confusing groups of plants, with line drawings of leaves, fruits, etc. Also included at the end is a glossary, a short account of mountain flowers in Britain, notes on conservation, societies to join, suggestions for further reading, and English and scientific indexes.

The one rather dubious feature of the book is the coining of English names from the Latin, where no true common name exists. Apart from this quibble, the book is warmly recommended to everyone interested in Alpines, whether as botanist or gardener.

VAH

Lichens of the Alaskan Arctic Slope by **John W. Thomson**. Pp. xv + 314 (including 1 map and 4 pages of monochrome plates). University of Toronto Press. 1979. $35

An authoritative account of an area of the world where lichens play an important, and often dominant, role in the ecosystem. The work is essentially taxonomic, with detailed keys and descriptions to 504 species, many new to Alaska, some new to North America and five new to science: *Cetrelia alaskana*, *Lecidea shushanii*, *L. carbonoidea*, *Lecanora concinnum*, and *Rhizocarpon cumulatum*. Sadly, the introduction is short and provides only a limited ecological background to a fascinating region which is only now becoming better known to the botanist and ecologist — more ecological information would have been welcome. The standard of production is excellent, although from the lichenologist's standpoint, the photographs convey little to supplement the meagre ecological information supplied.

MRDS

An Illustrated Guide to River Phytoplankton by **Hilary Belcher** and **Erica Swale**. Pp. 64. HMSO. 1979. £1.50 paperback

This attractively illustrated booklet is a worthy companion to *A Beginner's Guide to Freshwater Algae* by the same authors. Keys and brief descriptions are given to generic level for planktonic algae that commonly occur in British rivers, canals, broads, and lowland pools; the drawings are of named species. There is a brief introduction to the composition and growth of phytoplankton, and notes on collection, examination, counting, and recording. The guide is well printed on good paper and is fairly priced. It is strongly recommended to teachers, students and anyone with an interest in the smaller organisms of easily accessible freshwater habitats.

GFL

The Natural History of Britain and Northern Europe: Rivers, Lakes and Marshes by **Brian Whitton**. Pp. 224. Hodder and Stoughton. 1979. £5.50

The idea of producing a field guide to a habitat or geographical area is a recent innovation and one to be enthusiastically endorsed. An over-all competence, embracing invertebrates, non-vascular and vascular plants, birds, and mammals, facilitated by this approach, should promote a more satisfying appreciation of natural history. *Rivers, Lakes and Marshes* is this type of field guide.

An interesting feature is that the guide section is prefaced by an introductory, interpretive essay which provides an ecological perspective to areas the reader might visit. Also, the fragility of, and human pressures upon these habitats are discussed.

The guide section (128 pages) contains about 700 entries accompanied by a short description (average 50 words) of each species and, with few exceptions, a colour illustration. The latter gives a general impression rather than aiding identification.

The recent growth in the publication and by inference, sale, of natural history guides must indicate a growing real interest for this subject. Sadly, many recently published books are undistinguished while classic works remain out of print. *Rivers, Lakes and Marshes* however provides a useful addition to the groaning natural history shelves.

PJS

The Flora of County Carlow by **Evelyn M. Booth**. Pp. viii + 172, including 5 maps. Royal Dublin Society, Dublin. 1979. £6.50

This work is the culmination of devoted fieldwork undertaken for more than thirty years by one of Ireland's most loved and respected botanists. For Ireland it is the first flora of an inland county, the first written by a woman, and also the first county flora to be published since 1950.

Each of the listed entries of native plants and established aliens contains habitat notes and distributional data for five botanic districts based on the physiographic regions outlined in the *Soils of County Carlow*. The author also provides sections on the history of botany in Carlow, sites of botanical interest, trees and woodland, common names, a bibliography, a topographical index, and an index to flowering plant genera. Short accounts are given by invited authors on climate (D. Fitzgerald), geology and soils (M. F. O'Meara), bryophytes (D. Synott), lichens (M. R. D. Seaward), fungi and algae (M. J. P. Scannell), and a foreword is contributed by P. J. O'Hare.

Although Carlow cannot boast such an impressive range of plants species as many other Irish counties, nevertheless this small county has a quiet charm, varied topography and an interesting flora, all of which is self-evident from this welcome contribution to Irish botanical studies.

VAH

Botanical Atlas of the Harrogate District compiled by **W. H. Jowsey**. Pp. xii + 200. 1978. Obtainable from: Harrogate and District Naturalists' Society, 2 Olive Walk, Harrogate HG1 4RJ. £4.25 (including postage and packing)

Distribution maps, based on 1 km × 1 km grid-square mapping units, of an area bounded to W by Great Whernside, to E by the confluence of the Rivers Nidd and Ouse, to N by the River Ure at West Tanfield, and to S by the northern outskirts of Wetherby. The distributions of thirty-two pteridophytes and 758 spermatophytes during the years 1966 to 1977 are given, together with six maps showing contours, rivers and large streams, limestone areas, woods, railways, major roads, towns, and OS co-ordinates. Provision has been made for the up-dating of the *Atlas* during the periods 1978–82 and 1983–87, full details of which may be obtained from the address given above.

Environmental Chemistry of the Elements by **H. J. M. Bowen**. Pp. xvi + 333, including line drawings and tables. Academic Press, London. 1979. £17

This is a complete revision of the author's *Trace Elements in Biochemistry* published in 1966, which reviews in detail the distribution of chemical elements in the environment and living organisms. The scope may be gauged from some of the chapter titles: atmosphere; hydrosphere; elemental geochemistry of rocks; soils; biosphere and elemental cycles; elemental composition of living matter; uptake and excretion by organisms; essentiality, deficiencies and toxicities; chemical forms and functions; radioactive nuclides in the environment; environmental effects of human activities. The text concludes with a most informative 37-page summary of the elements in the geosphere and biosphere; this is followed by a 43-page bibliography. The book also contains the periodic table, symbols and units and a useful index. There is a wealth of reference information and source material to be derived from this excellent review; the book can be recommended not only to the biochemist but also to the environmentalist, ecologist and biogeographer.

MRDS

Henderson's Dictionary of Biological Terms by **Sandra Holmes**. Pp. xii + 510. Longman. 9th edition. 1979. £9.95

Since the publication of the 8th edition sixteen years ago there has been a rapid growth in biological knowledge. An extensive revision of this successful dictionary was therefore necessary: the number of entries has been increased from 16,500 to approx 22,500, and two important new features are the tables of classification of the plant and animal kingdoms which appear at the end of the book. An invaluable reference book for students, teachers and established researchers in biology and related subjects.

Policies for Landscapes under Pressure edited by **Andrew W. Gilg**. Pp. vii + 123. Northgate Publishing Company, London. 1979. £11

An important collection of papers resulting from the 10th symposium of The Landscape Research Group held at the University of Exeter, 22–24 September 1978. Topics covered include: field mapping, aerial photography and landscape policies (particularly for Exmoor, the Lake District and the Peak District), as well as an account of the symposium's field excursion to Dartmoor. Alas, at this price, only the delegates to the symposium and a few libraries will provide the sources for dissemination to planners, conservationists and landscape architects.

A Guide to the Pennine Way by **Christopher John Wright**. 3rd edition. Pp. 240, including numerous monochrome photographs and maps. Constable. 1979. £3.95

A welcome new edition of this excellent guide, invaluable to all walkers along the Pennine Way, whether novices or old hands. There is helpful practical information on accommodation, route finding, safety precautions, equipment, availability of supplies, weather conditions, etc. The route directions are admirably clear, noting every feature to watch out for along the Way: the walker with this guide in his rucksack is very unlikely to get lost. The text is lavishly illustrated with maps and photographs, many of these with superimposed text identifying natural features, which should prove helpful when trying to pinpoint one's position.

VAH

The Lakeland Peaks by **W. A. Poucher**. 7th edition. Pp. 441, including numerous monochrome photographs and maps. Constable. 1979. £4.95. **The Welsh Peaks** by **W. A. Poucher**. 7th edition. Pp. 426, including numerous monochrome photographs and maps. Constable. 1979. £4.50

These two new editions of Constable's pictorial guides for walkers and climbers are presented in the same format as *A Guide to the Pennine Way* (reviewed above) and retain the same high standards of authorship and publication.

Yorkshire: the Dales by **Maurice Colbeck**. Pp. 160 (including map) + 27 black and white photographic plates. Batsford. 1979. £6.95

Text and illustrations which capture the charm and interest of an area, defined for this topographical work as from the R. Aire to the R. Tees, and from Sedbergh in the west to the A1 road in the east, but mainly concentrating on the Yorkshire Dales National Park. Landscape, buildings and people all receive delightful treatment by the editor of *Yorkshire Life.*

British Tits by **C. M. Perrins**. Pp. 304, well illustrated. New Naturalist series. Collins. 1979. £6.50

The New Naturalist series sets the standard by which other natural history books are judged. Readers interested in population ecology will find the latest issue to be one of the best and most informative yet. It covers in full the feeding, breeding and behaviour of the six British species of *Parus* (coal, great, blue, crested, marsh, and willow tits) and the long-tailed tit. Each of these is given a separate chapter.

The remaining ten chapters contain some of the most comprehensive ecological data available for any group of animals in the world. We read how competition between the species is reduced by habitat selection and by the exploitation of different foods. The territorial behaviour of tits has been extensively studied in Britain and Europe and is described here in detail. The possible role of territoriality in population regulation is critically assessed.

Later chapters deal with reproduction, mortality and population dynamics, linking carefully analysed field work with up-to-date ecological theory in a lucid and informative text. There is a full bibliography which will allow points of interest to be followed up in the technical literature.

This is one of the best natural history books to appear in years. I recommend it to ornithologists and ecologists and to anyone who would like to become a more scientific, ecologically aware bird watcher.

MJC

Historical Ecology: The Documentary Evidence by **John Sheail**. Pp. 21, including 8 plates and 11 figures. 1980. £2. **Atlas of the Bumblebees of the British Isles** compiled by **International Bee Research Association** and the **Biological Records Centre**. Pp. 32, including 27 maps. 1980. £2

Latest publications from the Institute of Terrestrial Ecology (Natural Environment Research Council), Cambridge: the former work will be of value to ecologists, historical geographers, naturalists, and environmentalists, and the latter work contains distribution maps of twenty-six species of *Bombus* and *Psithyrus* (Hymenoptera: Apidae).

The Twelve Months of the Year edited by **Euan K. Dunn** and **David Black**. Pp. 120, including many monochrome and coloured illustrations. David and Charles, Newton Abbot. 1980. £5.95 hardback, £3.95 paperback

An attractive combination of text and plates showing the changing seasons and their effects on natural history: each month is prefaced by a coloured illustration spread over a double page depicting many characteristic features of the landscape and its plants and animals.

Erratum

It is with regret that I both misquoted the title and misspelt the name of its author in my recent review in *The Naturalist* (**105**: 39). The title of the book should be *Discover Birds* (not Discovering Birds), and the author is the well-known Scottish ornithologist Ian Wallace.

MD

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Edited by M. R. D. SEAWARD, MSc, PhD, FLS, The University, Bradford

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Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

LECTURING SERVICE

The Yorkshire Naturalists' Union maintains a list of speakers willing to lecture on a variety of natural history subjects. Secretaries of Affiliated Societies and similar bodies should apply to the Administrative Office, Mr D. Bramley, c/o Doncaster Museum, Chequer Road, Doncaster DN1 2AE for further details of this service.

A REQUEST

It is proposed to start an album of photographs of interest to the Y.N.U. We would be very glad to receive prints of people or events either as a gift or on loan for copying, with dates and as much information as possible. We hope the collection will stretch from the early years of the Union to the present day and become part of the Y.N.U. Archives.

Please send to Mrs J. E. Duncan, 23 Rupert Road, Ilkley LS29 0AQ.

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Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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MAMMAL STUDIES IN YORKSHIRE — A REVIEW

T. M. CLEGG

Presidential Address to the Yorkshire Naturalists' Union, Leeds, 1 December 1979

The choice of a subject for this Presidential Address gave my mind considerable food for thought during the early part of this year. It had, I felt, to be a mammal subject and preferably related to the forthcoming centenary, in just over a year's time, of the publication of William Eagle Clarke and William Denison Roebuck's *Handbook of the Vertebrate Fauna of Yorkshire.* It took a visit from Dr E. W. Taylor, a past president and the Union's oldest continuously serving member, who joined in 1911, to crystallize my ideas. Dr Taylor came to the Yorkshire Museum to look over the mammal collection of Adam Gordon of Duncombe Park, which the latter gave to the Museum in 1977. Dr Taylor and Adam Gordon shared many mammal experiences in the earlier decades of this century and the latter, a field naturalist and taxidermist of legendary skills, is now not much younger than Clarke and Roebuck's *Handbook*.

The *Handbook* covered all the vertebrates of the county and, appropriately enough, the mammals were the province of Roebuck. His brief accounts of distribution and status have been used as a baseline by generations of Yorkshire mammalogists. In his presidential address to the Union in 1955 Dr Taylor (1956) took as his subject 'A survey of our knowledge of Yorkshire mammals, 1881–1955'. By extracting all the records contained in *The Naturalist* and adding other observations made during the seventy-four-year period he provided a new benchmark in mammal study in the county and his important paper provided a foundation for much of the work of the last twenty-five years. My own interest in mammals was quickened by this paper and a lecture by F. J. Pickvance, then secretary of the young Mammal Society of the British Isles (later The Mammal Society).

The non-avian vertebrate section of the Yorkshire Naturalists' Union, has always suffered from its nomenclature. At one stage it was known as the Mammals, Reptiles, Amphibians and Fishes (MRAF) Section, then the names were reversed to give FARM — an odd acronym. I shall refer to it hereafter as the Mammal Section, not because of prejudice but merely in the interests of brevity and the matter in hand. The section has always had a Cinderella reputation, small in numbers and resources for tackling large-scale projects. However, there has never been any lack of enthusiasm among the members and the annual reports of the 1950s and 1960s reflect endeavours out of all proportion to the size of the membership. Much of the credit for this must go to Ellen Hazelwood and John Govett who flew the section's flag for much of this period.

To return to my theme; it is my intention to review mammal study in the county over the the last couple of decades, not by trying to add to Dr Taylor's survey but by looking at developments and directions of research plus of course a number of exciting events of recent years. In some ways I feel, from my middle-aged standpoint, that the two decades or so which cover the period of my interest in mammals mark a transition from an older, collection-based, approach to new sophisticated ways of dealing with distributional data and tackling ecological problems. My original projects involved collecting as a major activity, as befits a museum upbringing, and subsequent work was likely to be on the results of collecting. The species which attracted me most was the house mouse, *Mus musculus*, and this I pursued assiduously from the sand dunes of Spurn (1963) to the lower reaches of coal mines.

When I first began to look at mammals on the Spurn Peninsula I approached Ralph Chislett, as Chairman of the Spurn Committee, for permission to trap a reasonable series of the small mammals in the area. His immediate answer was, 'what do you call reasonable?'. We agreed a number of specimens to be taken, which I rationalized as being just about the

same in its effects as having a short-eared owl present on the reserve for a week at a time. Later on, after experience of my taxidermic operations and post-mortem ploys, the general view among the ornithologists was that they would have preferred the short-eared owl.

Mapping Schemes and Distribution Studies

A provisional atlas of British mammals is now available and the national mapping scheme is, after more than a decade of effort, in its final stages. The ten-kilometre square as the plotting unit has been superseded by the tetrad and one-kilometre square at local level. In Yorkshire a pioneer effort has been that of Derek and Shan Whiteley (1976), whose distribution maps, covering twelve ten-kilometre squares of the Sheffield area, plotted at the one-kilometre level make their paper a model of its kind. Their data, built up from the results of public appeals for information, the fieldwork of Sorby Society members, prey remains analysis, and such sources of information as scouring roadside lay-bys for bottles containing mammal remains, exploits every opportunity available to the mammalogist. Derek Whiteley's talk to the Mammal Section on bottled mammals will long be remembered with a mixture of nausea and admiration.

A fundamental source of local information which has come into being in recent years is the biological data bank. These banks are now established in all parts of the county, most of them operated by museum services on behalf of their local authorities. These units are now, in some instances, thoroughly integrated into the planning and development structures of the local authorities, whose recent responsibilities include the local application of protective legislation covering badgers, otters and certain bats.

To allow data banks to collect information quickly, short-term employment schemes, such as the job creation programme, have allowed the temporary employment of people qualified for this work. Thus the ill wind of unemployment has blown somebody a bit of good, if only temporarily.

In connection with distribution studies it is worth emphasizing that even casual records are still of significance when added to data bank compilations and naturalists of all persuasions can make useful contributions in this department. This information can have a bearing on conservation and the recent extension of legal protection to badgers in West Yorkshire was influenced by the accurate assessments of the animal's status which were available for consideration.

The Yorkshire Mammal Group, a society based at York, was formed by four enthusiasts of whom Dr Michael Thompson is the only founder member active at the present time. The Group, now enlarged, carries on scientific survey work, particularly on Trust reserves, and has produced a great deal of distributional data in recent years (Cowx, 1971); (Aspinall and Thompson, 1973). A live trapping weekend, dedicated as a memorial to D. L. Aspinall, a founder member of the group, is used to cover little known parts of the county. The 1979 exercise yielded twelve new records for the grid square in which it took place. The Mammal Group has been extremely active in otter surveying and in providing mammal data for conservation purposes in the Derwent Valley.

Detailed Studies

1. *Insectivores and bats*

Long-term studies of hedgehog *Erinaceus europaeus* road mortality in the Scarborough district by C. I. Massey (1972) demonstrated what results could be achieved by collecting records from willing helpers as well as using travelling time on a regular route productively. There have been relatively few analyses of this type carried out but it is not too late to start such operations, which may yield comparative data on hedgehog abundance, seasons of activity, etc. The suspicion that hedgehogs in some areas have learned to cope with the menace of the motor vehicle may be true, as may be the alternative view that the hedgehog population has declined due to road mortality, agricultural chemicals and so on.

Other than the pioneering efforts of Armitage and Whitaker in the first decade of this century and more recently the work of Colin Howes and Michael Thompson, bat studies in

Yorkshire were largely the province of one man, Adam Gordon of Helmsely, who added an apparently lost species and a new species to the county list. These were the lesser horseshoe bat *Rhinolophus hipposideros* and the barbastelle bat *Barbastella barbastellus*. The latter was recorded for the first time in 1930. Two more bat species have been added since 1972 — Brandt's bat *Myotis brandti* which was found near Pateley Bridge in 1972 (Thompson 1979), and the serotine bat *Eptesicus serotinus*, found dead at Greaseborough, Rotherham, in 1977 (Ely, 1979).

Brandt's bat, which was first described from Eastern Europe in 1970, was found alive by R. Stebbings of the Nature Conservancy Council and earlier records of this species in Yorkshire have been located by Thompson (1979) after critical examination of whiskered bats *Myotis mystacinus* in museum collections. The two species are closely related. It is on single species or single colonies of some species that most of the recent work has been carried out. Michael Thompson has studied the pipistrelle bat at colonies in York suburbs and dormitory villages (1977) and whiskered bats (op cit) and Colin Howes has looked into the food of noctules (1974) and their distribution, etc (1979), as well as the lives of pipistrelles near Doncaster (1973).

2. *Mountain hare*

The mountain hare *Lepus timidus* was not considered as a Yorkshire mammal by Clarke and Roebuck (1881) though the first introductions were made to the Pennines, between Sheffield and Oldham, around 1870. In contrast to other introductions the hares prospered and a recent detailed study by Yalden (1971) suggests they may be increasing their range in the Peak District. The Sorby Society have maintained a regular programme of blue hare watching, led by Mrs V. Clinging, in their area over recent years.

During the early 'sixties a hare shoot on Boxing Day at Langsett culled the blue hare population and those shot on that day were the perks of the keepers concerned. This practice may well have assisted the hare population in general through the winters by ensuring an abundance of food for the survivors. I recall one 'sportsman' whose day's tally was given as — forty-seven cartridges, forty-seven hares. In the hard winter of 1962–63 many hares died on Langsett moors and the deep piled droppings under walls and banks showed how they had 'yarded up' in extremely severe conditions.

3. *Rodents*

One of the longest running mammal surveys in the county is that of red *Sciurus vulgaris* and grey *S. carolinensis* squirrels in the Sheffield area. Their respective distributions have been studied since the middle 'fifties and the latest report is that of Herringshaw and Gosney (1974). My own interest in red squirrels in south Yorkshire and north Derbyshire centred around the introduced forms of the area (Clegg, 1970) and this is a field in which research like that carried out by Colin Howes (1973) in archives and estate papers might produce further results in ascertaining the possible origins of some of our red squirrels.

Archaeological excavations in York recently added an interesting historical footnote to the status of the black rat *Rattus rattus* in the county when a skull was discovered in Roman levels. This species appears to lack enthusiasts at present though in the early 'sixties I had no difficulty in obtaining specimens through the good offices of the Port Health authorities of Hull and Goole.

The most exciting event recently among small mammal enthusiasts was the rediscovery of the harvest mouse, *Micromys minutus* in 1972. This species was re-established when Howes (1973 *YNU Ann Rep*) found skeletal remains in Barn Owl pellets from Thorne Moors. An explosion of records followed from a wide area of lowland Yorkshire. Many of these were the results of newly acquired skill in harvest mouse finding passed on by Dr Stephen Harris, organizer of the national survey of the species. Dickens (1975) and French (1975) have subsequently summarized the discoveries made in the Castleford and Selby areas. In 1916 Riley Fortune held the opinion that the species had not inhabited Yorkshire at all in recent times — a view I had no difficulty in accepting as gospel some fifteen years ago. Its re-emergence after ninety-one years of concealment is a minor miracle.

The dormouse, *Muscardinus avellanarius* for which only one record exists, since 1911, is the subject of another national enquiry but recent efforts have failed to disclose any. Taylor (1956) recorded the last known occurrence, at Goathland, since which a single animal at Millhouses, Sheffield, is the only known report. Clarke and Roebuck (1881) regarded it as thinly but generally distributed over the county.

The water vole, *Arvicola terrestris* a species which has aroused concern for its continued survival on our rivers at times, might be taken as typical of the smaller rodents which are widely distributed but failed to attract detailed researches. Howes (1979) work on the food and mortality of the species in Yorkshire is a compendium of regional information which summarizes all that is known of the species feeding ecology and place in the prey cycle of a wide range of predators. This type of information collected casually over a long period becomes interesting when analysed in this way.

An exotic rodent which had a brief period of feral existence in Yorkshire during the last twenty years is the coypu *Myocastor coypus*. In 1960 a terrier breeder whose stock was entered to coypu, to use the terminology of the dog fanciers, decided to save himself the expense of training excursions to East Anglia and introduced coypus to the flashes of the Rother Valley. The first notification of this took place when a gentleman brought a dead coypu kitten to Sheffield City Museum. It had been killed by his dog and he was curious as to the identity of the strange beast. A flurry of activity by the West Riding pest control brought the introduction to an end when the last coypu was killed at Ulley Reservoir. Since then the folklore of South Yorkshire, and the Broomfleet area of the Humber, has been enriched by the inclusion of giant rodents, of legendary ferocity and exotic origins. The facts are more mundane.

4. *Cetaceans*

The largest of Yorshire's mammals, the whales, were summarized by Spalding (1966) during the period when he was based at Hull Museum, where the collections include interesting material, as befit those of a former whaling port. In recent times the studies of Whitaker and Massey, at Scarborough, have maintained interest in the group. The note by Massey (1973) on a stranded white-sided dolphin *Lagenorhynchus acutus* at Cayton Bay concerns what was only the seventh Yorkshire record of this widespread northern species, though there have been a number since.

It is perhaps symptomatic of our changed attitudes towards whales and dolphins that the stranding of a white-beaked dolphin *Lagenorhynchus albirostris* at Spurn in March 1979 attracted international interest in its rescue and recovery but after a successful launch and re-stranding it was finally transported to Woburn where it died.

5. *Carnivores*

The fox *Vulpes vulpes* is our most widespread carnivore in habitat terms, and recent 'scatological' studies produce evidence of its versatility in feeding terms. The wide publicity of suburban fox life styles in London and other cities appear to have encouraged similar interest in Yorkshire foxes; those workers who have tackled the analysis of fox droppings have shown that diet lists correspond closely with the stocks of local supermarkets, but exact identification is often impossible due to the illegibility of packaging after it has been subjected to the alimentary processes of the fox.

Among the mustelids, the pine marten *Martes martes* retains a foothold in the county and much of its glamour. Clarke and Roebuck (1881) could only give a couple of localities and, with stations in the south-west and north-east of Yorkshire, it is at least as well off today. Colin Sims *(pers comm)* monitors a population in the north-eastern woodlands and reports, even in the popular press, suggest that the species is still present in the Wakefield — Barnsley — Huddersfield triangle. The polecat *Mustela putorius* just persisted into the early years of this century but as escaped ferrets increased the issue was clouded as to the date of its demise. Again a feral ferret population appears to be established in one area (C. Simms, *pers comm*) and there may well be others in the future.

A prime cause for concern at the present time is the status and conservation of the otter

Lutra lutra. Dr Taylor afforded it the same status as that given by the 1881 *Handbook* and even at the present time it is recorded regularly on a number of Dales rivers and eastwards to the Derwent. The latest record of the York population on the River Ouse, inside the city boundaries, which I have heard, concerned an adult and two young by Ouse Bridge in 1961. My informant was a policeman who encountered them there in the early hours of the morning. The plans for aquatic recreation on some lowland rivers, which local authorities are now formulating, may reduce the otter in these areas and leave only the relatively undisturbed headwaters of the rivers available for them.

The work of Simms (1971) in the northern vale of York suggests how status on particular streams can change and Howes (1976) has chronicled the decline in South Yorkshire. Thompson (1979) reviewed the otter situation in North Yorkshire and indicates that, at present, the position of the species is relatively healthy. Now that the otter is given full legal protection, we must watch its fortunes closely since it is a species which could be lost by default as our rivers are subject to multi-usage schemes.

The introduced American mink *Mustela vison* is a species which was not reviewed by Dr Taylor but it is now an established, if unwelcome, addition to the mammal fauna. Mr P. Clarke of the Ministry of Agriculture, Food and Fisheries has been concerned professionally with the species since it began its colonization of the county. The first records were those of escapes in the vicinity of mink farms and there was an early spread into the south-west of the county from Cheshire. At the present time the rate of spread appears to have increased again and East Yorkshire records suggest a dynamic situation. Anti-mink campaigns appears to wax and wane in their intensity but at the moment concern is being expressed in fisheries circles about the possible effects of mink on fish stocks. The species has taken little more than fifteen years to achieve its present distribution.

A complete contrast is offered by the badger *Meles meles* it appears to have increased at a relatively leisurely pace since the *Handbook's* summary 'very local, and extremely limited in numbers'. Dr Taylor noted its increase in 1955 and since then the monograph of *Badgers in Yorkshire and Humberside* by Paget and Middleton (1974) has produced definitive information on its current status. Their reports on the progress of the national badger survey in Yorkshire (*Naturalist* 1968, 69, 72) chart their path towards their monograph which is a triumph of recording and fieldwork. Among the good effects of this study has been the recent extra protective legislation given to the badger in West Yorkshire. On a personal level I was delighted to watch the progress of these protective measures towards legislative completion during my presidential year.

The wild cat *Felis sylvestris* is long gone from Yorkshire — the last in South Yorkshire in 1621 (Howes, 1973) and in West Yorkshire in 1680 (Taylor, 1955), but Colin Howes has recently initiated a survey of the domestic cat as a predator, and at times prey species, and judging by the media coverage there can be few people unaware that cat-watching is the latest public participation sport. We must look forward to his analysis of the family feline as a faunal factor.

6. *Seals*

There is little one can say about seals except that at least one female grey seal *Halichoerus gryphus* has deposited a pup on a Yorkshire beach to establish a temporary bridgehead as a breeding species. The common seal, *Phoca vitulina*, driven out from Teesmouth at the beginning of the century by a combination of industrial development and hostile behaviour, has failed to colonize Spurn from its Lincolnshire strongholds. A breeding record from the river Wharfe at Boston Spa remains the oddest dot on the atlas map.

7. *Deer*

The formation of the British Deer Society has led to an increase in interest and knowledge of this group in the county. The Roe deer has spread dramatically in recent years since Roebuck summarized it as 'domesticated, in a few parks only' and Dr Taylor had only one unconfirmed record from the Ampleforth area as late as 1955. C. I. Massey has chronicled the increase of the species in the north-east of the county and in the last ten years or so it has spread into Humberside, South and West Yorkshire.

The fortunes of the introduced sika deer *Cervus nippon* in the Bowland area have been watched by Mitchell and Robinson (1972) and again Deer Society interest has been considerable in this species. The muntjak *Muntiacus muntjak* may yet arrive from the south and in the last two years four have taken the road to freedom by escaping from confinement at Studley Royal. A future reviewer may be able to report on their progress.

Mammal Study and the Union

The Naturalists' Yorkshire (1971) was a popular publication produced by the Dalesman Publishing Company in conjunction with the Union. Ellen Hazelwood wrote the mammal account for this to give a picture of the fauna which was likely to be of interest to a wide readership.

This type of publication has much to commend it in which the results of fieldwork are summarized and presented to the wide public on whom we, as naturalists, depend for support and interest. There is now a greater interest in natural history than ever before and we should be conscious of this.

Now that the Union's annual reports are restricted in size by economic considerations the reports issued by local societies have become important sources of information. Bradford, Scarborough, Castleford, and Sheffield are well served in this way. In recent years annual reports covering Fairburn Ings and Potteric Carr nature reserves have carried mammal information also.

The Halifax Scientific Society published their *Vertebrate Fauna of the Halifax Parish* in 1965 and this was another work in the best tradition of local faunal coverage. The mammal section was the work of Maurice Johnson who did a great deal to encourage mammal studies in the area.

The Union has been well served by its mammalogists for a hundred years and more. Dr Taylor looked forward from 1955 to 2033 and speculated on whether an account of the spread of myxomatosis through the county's rabbit population would be available to future workers. I would like to look forward to 2081 and think that in spite of present difficulties the Union, and particularly its non-avian vertebrate enthusiasts, might be thinking of updating its county handbook yet again.

I would like to close by thanking my fellow section members for their efforts, many of which I have failed to acknowledge in this review, and to pay special tribute to Dr Taylor, with whom I enjoy frequent meetings, and Adam Gordon for many past kindnesses when I began my mammal interests and whose superb collection of mammals now reposes in the Yorkshire Museum. They have been, and continue to be, an example to us all.

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BOOK REVIEWS

The Observer's Book of Sea Fishing by **Peter Wheat** and **Ray Forsberg.** Pp 190, with numerous illustrations. Warne. £1.50

Frederick Warne's *Observer's Books* have been with us a long time and there can be few naturalists who have not in their youth relied on one or more for their introduction to a subject. Their coverage is, of course, much wider than just natural history as this title shows. *Sea Fishing* is written by two experienced anglers and fully maintains the standard of the series. The text is clearly written and intructions on the techniques of sea angling are simply presented. There are useful sections on the identification of fish, and on the biology of the fish related to the means of capture. In short, the authors have produced an excellent but simple introduction to sea fishing which is fully within the tradition of the *Observer*'s series.

AW

Living Seashells: Molluscs of the English Channel and Atlantic Coasts by **P. Bouchet, F. Danrigal** and **C. Huyghens**; translated and edited by **B. E. Picton**. Blandford Press, Poole. 1979. £4.95

The publicity blurb on the cover of this superbly illustrated little book says 'Living seashells is an invaluable guide and should prove to be a standard identification work for marine biologists, beachcomber, diver or tourist'. I personally would stress, however, that this book should not be used by the inexperienced amateur to identify any species of marine mollusc without checking the identification afterwards with descriptions taken from standard reference works. Many of the colour photographs, although excellent in themselves, are too small for identification purposes, or they do not show any diagnostic detail. It should prove to be a good companion to such basic identification guides as British Bivalve Seashells by Norman Tebble.

The photographs of the living animals in their natural habitat are, however, a very useful addition to the published material available, and as such will be useful to biologists and naturalists generally. The book will be perhaps of most interest to those more privileged sub-aqua divers who are familiar with marine animals in their natural habitat.

AN

A Field Guide to the Land Snails of Britain and North-west Europe by **M. P. Kerney** and **R. A. D. Cameron**. Pp 288 with 24 colour plates, numerous text figures and 276 distribution maps. Collins. 1979. £5.50

The latest Collins Field Guide covers all the terrestrial slugs and snails found north of a line from the Pyrénées to the Alps. The format follows the familiar, successful models of Mitchell's *Trees*, Chinerey's *Insects* and Arnold *et alia*'s *Reptiles and Amphibia*. Each species is dealt with in detail in the text under the headings Distribution, Habitat, Range, and Taxonomic Description. Many of the species are illustrated by text figures and synonomy and authority are given for all the latin names. Gordon Riley's excellent colour plates show the shells from various angles and in the range of colour forms encountered in the field. Opposite the plate is a list of the species' names and hints on key points for identification.

There are European distribution maps for nearly all the species (276) and detailed British maps for all 116 native forms. There are no keys, but the combination of superb colour plates, line drawings and text descriptions should allow most terrestrial molluscs to be identified correctly by anyone willing to work patiently through the book.

This is another outstanding field guide, highly recommended to all naturalists. It is sure to give fresh momentum to the field study of European slugs and snails.

MJC

Vocal Communication in Birds by **Clive K. Catchpole**. Pp 68. Studies in Biology No 15. Arnold. 1979. £2.50

A concise and useful account of sound production and reception in birds. Chapter 1 covers production of sounds and hearing, Chapter 2 methods and techniques of study; the remaining chapters deal with functions of different kinds of calls, including songs, development of songs and dialects, and evolutionary aspects of song. Readable, understandable, comprehensive; strongly recommended as an introduction for biology students, and good value at the price.

BS

ECOLOGICAL STUDIES AT ASKHAM BOG NATURE RESERVE
1. INTER-RELATIONS OF VEGETATION AND ENVIRONMENT

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Introduction

Askham Bog is a small valley mire about 5 km SW of York. It lies at about 12 m AOD and is surrounded by the raised ground of the York moraines (Fig 1). The Bog is about 1.7 km long and 250–400 m wide, and covers an area of 43 ha. It is fed by a small stream rising about 0.5 km to the W and now diverted past the N side of the Bog, and by inflow from the moraine to the S, and is drained by the same stream. The initial fall on the outlet stream is, however, only about 0.1 m over a distance of 3 km, and consequently, despite the installation of a pump by the Marston Moor Internal Drainage Board, is unable to cope with the winter flows, allowing flooding of the Bog in wet winters. Askham Bog is floristically very rich; 312 species of higher plants have been recorded recently, and full details of these and of the other major plant and animal groups are given by Fitter and Smith (1979). Most of the Bog is birch *(Betula pubescens)* woodland, although alder *(Alnus glutinosa)* and oak *(Quercus robur)* are locally dominant, and extensive willow carr occurs, primarily composed of *Salix cinerea* s.l. Apart from small areas of sand along the northern side, the substratum is peat, ranging up to at least 2 m in depth. Details of the postglacial history of the site are given by Hall *et al* in Fitter and Smith (1979), who describe several curious features. The general stratigraphy reflects a typical hydrosere, with lake muds overlain by fen peat, and this by *Sphagnum-Eriophorum* peat. This is, however, succeeded by more fen peat, on which *Sphagnum* is now growing in some places.

In addition there are dykes surrounding and crossing the Bog, of which the northern marginal dyke is free-flowing, regularly dredged, and of little interest. The others are in various stages of infilling and are dammed as a water conservation measure; they have a rich flora and fauna. Outside the Bog proper are a number of areas of grassland, some very species-rich and containing species very scarce locally, such as *Cirsium dissectum*, here almost at its northern limit in Britain.

The Bog is managed and partly-owned by the Yorkshire Naturalists' Trust Ltd and is currently listed by the Nature Conservancy Council as a Grade 2 site, according to the grading in Ratcliffe (1977). A number of studies have been published on the site in the last hundred years, beginning with a series of articles in the *Natural History Journal* for 1879, followed by two MSc theses (Day, 1933 and Handley, 1968), and a recent survey by Fitter and Smith (1979). This paper discusses the diversity of vegetation types present at Askham Bog and an explanation for their distribution based on environmental features.

Methods

The whole Bog was covered by a 50 × 50 m grid, with marker posts at the intersections. All survey work was based on this and was carried out in Far Wood unless otherwise stated.

Vegetation Survey

Two 1 m^2 quadrats were examined at 25 m intervals on all the grid transects at right angles to the long axis of the Bog. Frequency of all species of the ground vegetation (including mosses and small shrubs) was recorded as incidence in each of twenty-five compartments of the quadrat. Numbers of stems and basal areas of all trees within 3 m of the sampling point were measured. A total of eighty-four samples were obtained.

Separate analyses were performed on the data for ground vegetation (frequency), trees (basal area), and all species (incidence). Initial assortment was by Ward's method in the CLUSTAN IC package, and re-arrangement was carried out on standard phytosociological criteria.

Topography

In February 1977, after a period of exceptionally heavy rainfall, the entire site was flooded to a minimum depth of 10 cm, and a contour map was constructed by plumbing. Measurements were made at 25 m intervals in Far Wood and converted to m AOD by comparison with a single E-W transect surveyed trigonometrically. Middle Wood was surveyed at 50 m intersections.

Hydrology

Water-table records were made by Miss N. Day from 1968 to 1974 in three pipes in positions P1–3 on Fig 1. From 1974 to 1978 records have been taken from a transect of seventeen 1 m lengths of perforated plastic pipe in Far Wood (T–T in Fig 1). Both sets of pipes were recorded in 1974 to permit comparisons. Water pH in pipes, excavated pits, or of peat samples was measured in the field using a portable pH meter.

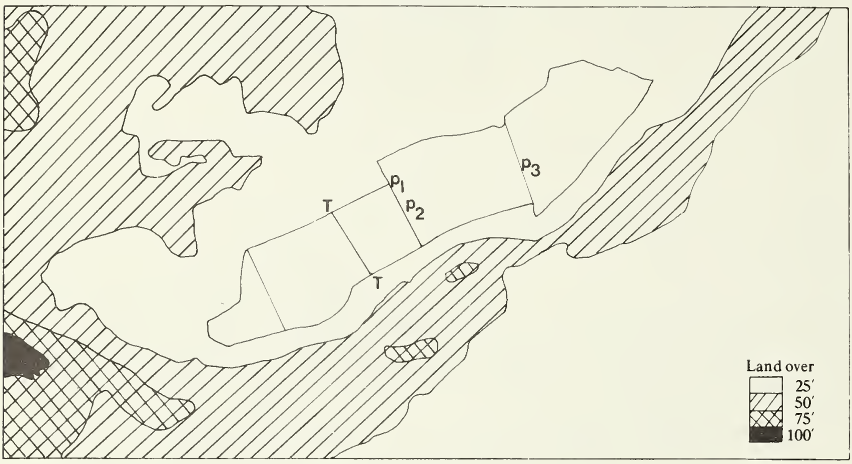

FIGURE 1

Map of Askham Bog and surrounding land. The Bog is divided into four sections by ditches and is surrounded by ditches. T-T represents the transect of water table pipes; **P_1**, **P_2** and **P_3** are the sites of the earlier pipes (see text).

VEGETATION

The most consistent groupings were obtained using the analysis of frequency of the ground vegetation, and this is the basis of the following discussion. A summary is shown in Table 1, along with percentage constancy of trees and shrubs. Two basic types can be recognized with six variations of each. Groups A–F represent species-rich fen vegetation, with total species lists of between twenty-three and thirty-nine species, and mean numbers of species per 2 m^2 sample ranging from 9.0 to 13.7. Groups G–L comprise floristically poorer, acid woodland vegetation, with between thirteen and twenty-four species in total, and mean densities from 6.9 to 11.3. Certain species, such as *Filipendula ulmaria*, *Urtica dioica*, *Galium palustre*, *Rubus caesius*, and *Thelypteris palustris* are almost wholly confined to the fen group, whereas *Dryopteris austriaca*, *Lonicera periclymenum*, *Molinia caerulea*, and *Sphagnum palustre* are characteristic of the acid woodland.

Of the fen groups, B, C and D show strong similarities, sharing an abundance of such species as *Poa trivialis*, *Urtica* and *Filipendula*, while E and F are distinguished by constancy of *Scutellaria galericulata*. Group A is a very distinctive community characterized by the rather scarce grass *Calamagrostis canescens*. The only other grouping to have this

species at all frequently is G, one of the acid groups, and these two groups represent a link between the two types. The remaining acid groups are characterized by various combinations of *Lonicera*, *Molinia*, *Rubus fruticosus*, and the three *Sphagnum* species, culminating in the extreme group K which is almost mono-specific for *Molinia* in the field layer.

Trees and shrubs make up only 26–39 per cent of the total species lists for the fen woods, but 38–50 per cent of those for the acid woods. Individually, *Alnus glutinosa* is strongly associated with groups C and D, both characterized by *Poa trivialis*. *Betula pubescens* is rather uniformly distributed, though less so where *Alnus* is abundant, while *Quercus robur* clearly predominates in the acid groups. *Salix cinerea* is most common in groups A, B and F, all groups with little *Alnus*.

The fen woods have clear affinities with both the *Osmundo-Alnetum* (Klötzli, 1970) and the *Carici elongatae-Alnetum glutinosae* (Bodeux, 1955). The former is in many ways an oceanic variant of the latter, and is preferred for British alderwoods by Klötzli, partly because of the scarcity of *C. elongata* here. Askham Bog in fact harbours the largest colony of this rare sedge in England (David, 1978), growing almost exclusively in vegetation type C. *Osmunda regalis* also occurs in the same habitat and in group A. However, several of the characteristic species of the *Osmundo-Alnetum* sub-association *Lycopetosum* (Wheeler, 1978), the most appropriate for these samples, are not found in Far Wood, including *Carex acutiformis*, *C. paniculata*, *C. remota*, *Eupatorium cannabinum*, and *Peucedanum palustre*, largely because the type localities are in East Anglia. Wheeler (1975) refers two samples from Askham Bog to the *Carex elata* variety of this sub-association. *C. elata*, though abundant here, is however rather localized — it occurs mainly in the dykes and in group A, which Wheeler appears to have sampled — and does not seem to provide a sound basis for classification.

Groups A–F, the fen woodlands, can therefore be assigned to one of these two associations, but G–L, the acid woods, are more problematical. Tüxen *(pers comm)* regards them as forming the sub-association *Molinietosum* of the *Carici elongatae-Alnetum*. They bear a close relationship also to the *Betulo-Dryopteridetum cristatae* (Wheeler, 1978), though lacking *D. cristata*, which became extinct through collecting at Askham Bog in about 1890, and to an unascribed community from Norfolk described by Wheeler (1978), and termed a *Betula-Myrica* community.

The distribution and composition of these vegetation groups (Fig 2) closely resembles those described by Tüxen and Dierschke (1974) for the Lahrer Moor, a mire system in NW Germany, where the main communities are referred to the *Carici elongatae-Alnetum glutinosae*. It may be that the alderwoods of eastern England are as well referable to this association as to the *Osmundo-Alnetum*.

Topography

Both Far Wood and Middle Wood are clearly domed (Fig 3), the dome being about 35 cm high in Far Wood and 30 cm in Middle Wood. The pronounced 'cliff' in the NE corner of Middle Wood represents an outcrop of sand. The domes strongly suggest peat growth due to *Sphagnum*, and in Far Wood match closely the distribution of both the *Sphagnum*-rich vegetation groups (Fig 2) and the *Sphagnum* species themselves (Fig 4). The domes do not follow the long axis of the Bog, but each is discrete within the sections bounded by cross-dykes, suggesting that the dykes are old structures. The dykes appear on the earliest map (1785), along with a now almost totally infilled dyke in Middle Wood, lying roughly between the two domes there. They were probably dug to aid the removal of cut peat, as at Woodwalton Fen (Poore, 1956); peat extraction at Askham Bog was intensive until perhaps about 1750 (Fitter and Smith, 1979).

The various vegetation types can be assigned approximate topographic levels on this basis (Table 1). The six fen groups range from mean heights of 0–14 cm above the mean for the lowest group (C); the acid groups, by contrast, lie between mean heights of 21 and 32 cm above this datum.

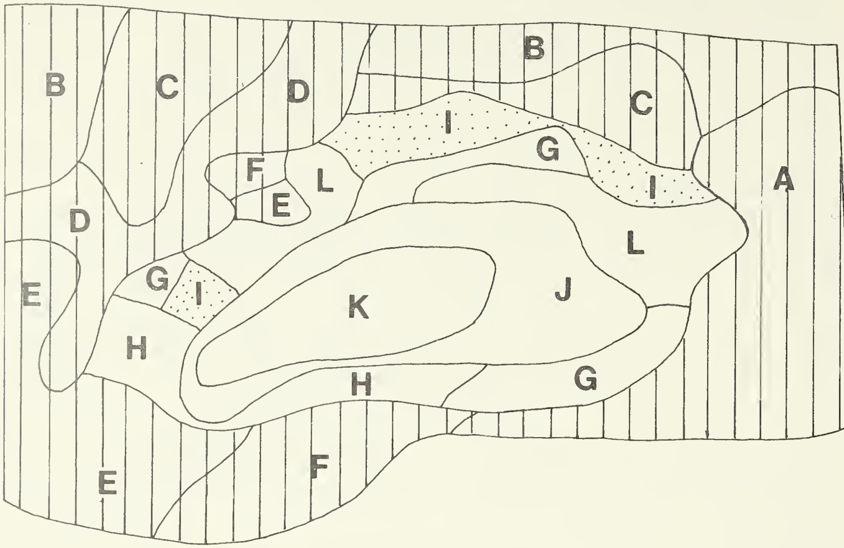

FIGURE 2

Vegetation groups in Far Wood. The area occupied by types A-F, the 'fen' vegetation is hatched. The anomalous group I is stippled.

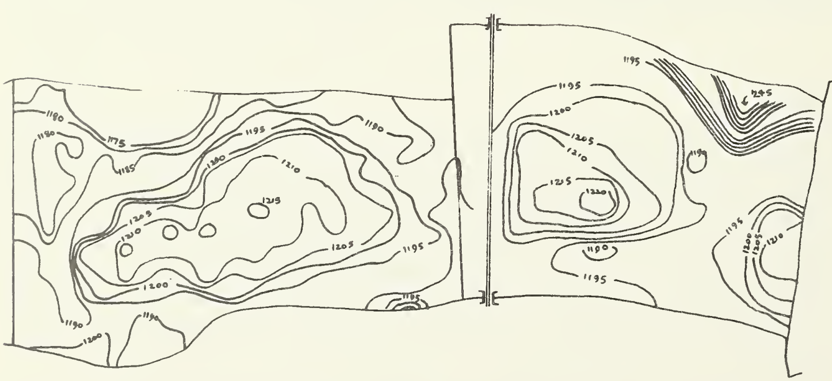

FIGURE 3

Contour map of Middle and Far Woods. Figures are cm AOD.

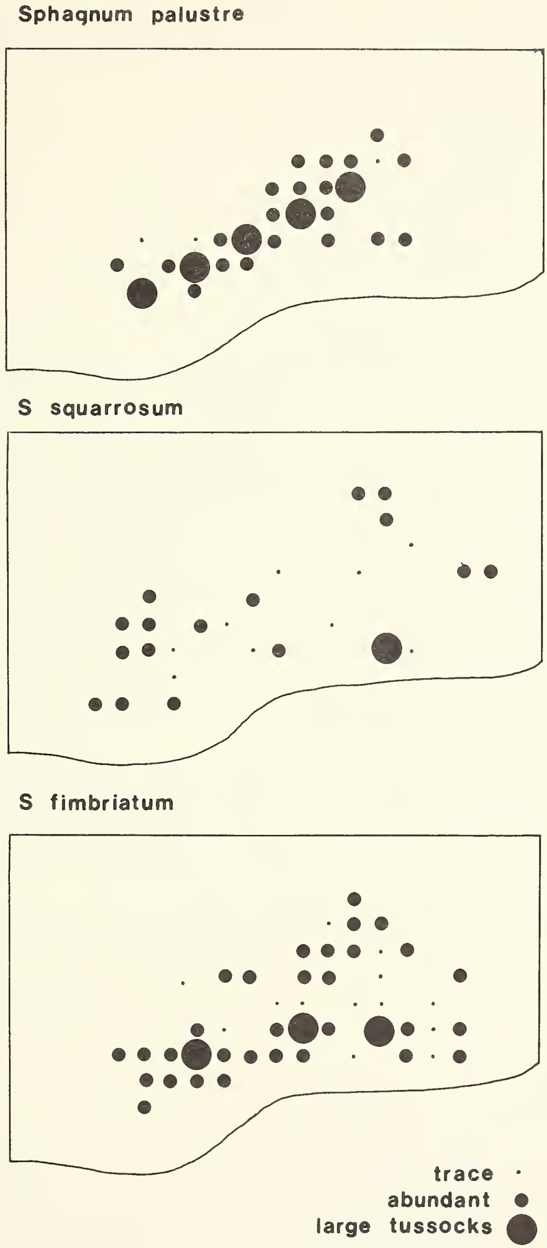

FIGURE 4

Distribution of three *Sphagnum* species in Far Wood.

TABLE I

Floristic groupings recognized from Far Wood, Askham Bog. Figures represent percentage constancy to the group; only species achieving 50 per cent constancy in at least one group are shown. Figures in italics represent species achieving mean frequency > 15%.

	Fen Woodlands						*Base — poor Woodlands*					
	A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*
I *Alnus glutinosa*		38	91	70	29		20	25	60			29
Calamagrostis canescens	*100*	38	11				*80*	25	20			29
II *Filipendula ulmaria*	43	88	67	70	71	75						
Galium palustre	*71*	25	33	90	71	75						
Lysimachia nummularia	29	25	44	60	14	50	40					14
Phalaris arundinacea	43		11	10	14	*100*			20			
Rubus caesius	71	25	44	20	14	*75*			20			
Scutellaria galericulata	14	13	33	20	100	100						
Thelypteris palustris	57	13		40	43	50						
Urtica dioica		*100*	*100*	90	14	25						
IIIa *Dryopteris austriaca*	29			10			60	75	40	30	17	57
Lonicera periclymenum			11		14		*100*	*100*	*100*	*100*	17	57
Molinia caerulea	14						20	25	40	*100*	*100*	14
IIIb *Sphagnum squarrosum*	14				14		40	50		20	50	14
S. fimbriatum								*100*		*80*	67	28
S. palustre								50		40	*100*	14
IV *Betula pubescens*	100	75	67	70	86	100	100	100	80	100	100	100
Corylus avellana							20		60			
Crataegus monogyna	43		33		14			25	60			14
Frangula alnus	14				43		20	25		50	33	43
Quercus robur	43	75	44	60	14	75	100	100	100	100	83	86
Salix cinerea	71	63	22	20	14	75	20			10		14
Dryopteris spinulosa	29		33	10	29	25	40	75	60	70	50	43
Lysimachia vulgaris	86	25	89	50	*71*	75	60	50	20	10		29
Phragmites australis	86		11		57	50	80	50			33	57
Poa trivialis	29	75	*100*	*100*	*100*	50	20	50	40			14
Rubus fruticosus	43	25	11	30	71	50	40		*100*	70		*100*
Solanum dulcamara	29	38	56	*100*	57	50	20	25	20	10		43
Viburnum opulus	14		33			25	20	50	60			14
Eurhynchium praelongum	71	38	44		29		60		20	30		14
Mnium hornum	43	13		10	14	50		50	20	20		29
No spp./sample	13.7	9.0	12.3	11.8	11.4	13.5	10.8	9.3	8.4	11.3	6.9	9.4
cm above mean ordnance datum for group C	14	7	0	5	10	12	21	26	24	29	32	23

TABLE 1

Floristic groupings recognized from Far Wood, Askham Bog. Figures represent percentage constancy to the group; only species achieving 50 per cent constancy in at least one group are shown. Figures in italics represent species achieving mean frequency > 15%.

	Fen Woodlands						Base — poor Woodlands					
	A	B	C	D	E	F	G	H	I	J	K	L
I *Alnus glutinosa*		38	91	70	29		20	25	60			29
Calamagrostis canescens	*100*	38	11				*80*	25	20			29
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Galium palustre	*71*	25	33	90	71	75						
Lysimachia nummularia	29	25	44	60	14	50	40					14
Phalaris arundinacea	43		11	10	14	*100*			20			
Rubus caesius	71	25	44	20	14	*75*			20			
Scutellaria galericulata	14	13	33	20	100	100						
Thelypteris palustris	57	13		40	43	50						
Urtica dioica		*100*	*100*	90	14	25						
IIIa *Dryopteris austriaca*	29			10			60	75	40	30	17	*57*
Lonicera periclymenum			11		14		*100*	*100*	*100*	*100*	17	57
Molinia caerulea	14						20	25	40	*100*	*100*	14
IIIb *Sphagnum squarrosum*	14				14		40	50		20	50	14
S. fimbriatum								*100*		*80*	67	28
S. palustre								50		40	*100*	14
IV *Betula pubescens*	100	75	67	70	86	100	100	100	80	100	100	100
Corylus avellana							20		60			
Crataegus monogyna	43		33		14			25	60			14
Frangula alnus	14				43		20	25		50	33	43
Quercus robur	43	75	44	60	14	75	100	100	100	100	83	86
Salix cinerea	71	63	22	20	14	75	20			10		14
Dryopteris spinulosa	29		33	10	29	25	40	75	60	70	50	43
Lysimachia vulgaris	86	25	89	50	*71*	75	60	50	20	10		29
Phragmites australis	86		11		57	50	80	50			33	57
Poa trivialis	29	75	*100*	*100*	*100*	50	20	50	40			14
Rubus fruticosus	43	25	11	30	71	50	40		*100*	70		*100*
Solanum dulcamara	29	38	56	*100*	57	50	20	25	20	10		43
Viburnum opulus	14		33			25	20	50	60			14
Eurhynchium praelongum	71	38	44		29		60		20	30		14
Mnium hornum	43	13		10	14	50		50	20	20		29
No spp./sample	13.7	9.0	12.3	11.8	11.4	13.5	10.8	9.3	8.4	11.3	6.9	9.4
cm above mean ordnance datum for group C	14	7	0	5	10	12	21	26	24	29	32	23

TABLE 2

Mean monthly changes in water table depth per unit net precipitation[1] or evaporation[2]

Water table depth (cm below bog surface)	*Change in water table (mm) per mm water surplus or deficit**	
	Surplus	*Deficit*
< − 40	+0.51 ± 0.23 (4)	-0.22 ± 0.12 (3)
−39 — −30	+0.41 ± 0.13 (2)	[−0.31] (1)
−29 — −20	+0.17 ± 0.02 (2)	-0.09 ± 0.04 (5)
−19 — −10	+0.15 ± 0.04 (3)	-0.21 ± 0.03 (2)
−9 — 0	+0.15 ± 0.05 (5)	-0.13 ± 0.04 (6)
+1 — +10	-0.00 ± 0.07 (6)	-0.48 ± 0.30 (7) or −0.18 ± 0.05 (6)†
+11 — +20	+0.21 ± 0.05 (2)	- (0)
> +20	[-2.07] (1)	- (0)

[1]Figures kindly supplied by Askham Bryan College of Horticulture.
[2]Figures kindly supplied by Meteorological Office, Finningley.

†omitting one aberrant value (−2.27; March 1977).
*water surplus = precipitation > PET; water deficit is the converse.

TABLE 3

Numbers of days per year for which each of eight vegetation groups experienced water tables less than 10 cm from the surface. Years run from May to April.

		1974–75	*1975–76*	*1976–77*	*1977–78*	
		601	417	789	561	: rainfall
		587	646	605	547	: PET
		+14	-229	+184	+14	: Difference
Pipe numbers	*Vegetation groups*					
1–2	A	219	126*	232*	150*	
3–4	G	192	46	228	129	
5–6	J	169	24	156	85*	
7–8	K	152	0	124	—†	
9–10	J	149	15	135	82	
11	I	129	7	115	13	
12–13	L	27	0	149	20	
14–15	C	112	1	212	31	
16–17	B	106	8	208	36	

†no pipes measured *only one pipe measured

TABLE 4

Standardized partial regression coefficients of mean monthly changes in water table on nett precipitation (P-E) and water table depth at the beginning of the month (WT).

Pipe numbers	*Vegetation group*	*r*	*b (P-E)*	*b (WT)*	*b(P-E)/b(WT)*
1–2	A	.873	.846	-.275	3.1
3–4	G	.936	.895	-.255	3.5
5–6	J	.916	.885	-.221	4.0
7–8	K	.918	.886	-.283	3.1
9–10	J	.929	.895	-.243	3.7
11	I	.912	.882	-.219	4.0
12–13	L	.910	.873	-.251	3.5
14–15	C	.881	.844	-.323	2.6
16–17	B	.823	.832	-.336	2.5

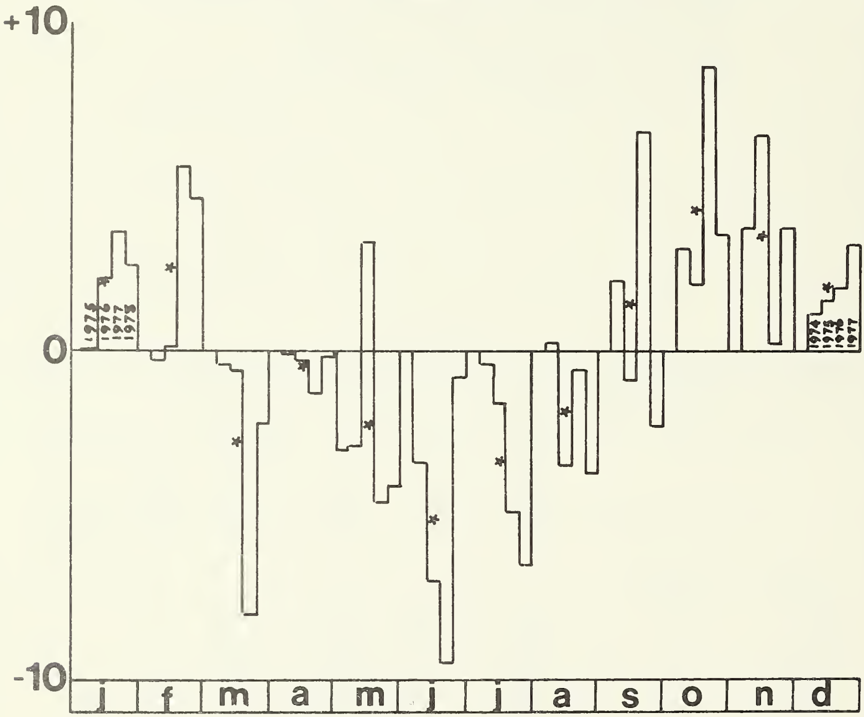

FIGURE 5

Histogram of mean daily change in water table (calculated as net change during month divided by number of days in month). Columns represent data for 1974 through to 1978, records running from May 1974 to May 1978. Asterisks are mean values for each month. Note two maxima of water discharge (March due to flood drainage, and June to transpiration) and of recharge (February due to flooding, and October, due to recharging after summer drought).

HYDROLOGY

The water-table exhibits marked annual cyclic fluctuation, and the rate of change of the water table, averaged over all four years of recording (May 1974–May 1978) and over all seventeen pipes, displays four distinct peaks (Fig 5). The raising of the water table in October is due to increased rainfall when the actual water table is low, that in February is due to winter flooding of the basin in which the Bog lies. The peak of water loss in June can be explained by transpiration, while that in March represents drainage of the flood water accumulated in February. The overall pattern accords with findings of Godwin (1931) at Wicken Fen and Kassas (1951) at Chippenham Fen.

Effects of precipitation (P) and evaporation (E) (= evapotranspiration) can be examined in Table 2, which shows mean monthly change in water table depth per unit net precipitation or evaporation, when water-table was at various depths. When precipitation is less than evaporation (water deficit), there is no consistent pattern: water table tends to decline by 0.1 to 0.2 mm per mm of net evaporation, irrespective of water table depth. With precipitation in excess (water surplus) however, the rise in water table is much greater when the table is low than when it is near or at the surface, as a result of surface drainage at high water-tables. At very high water tables (>20 cm above the surface), the single large negative value represents rapid flood drainage.

The behaviour of the water-table in individual vegetation zones is more complex. In the wettest of the four years, all zones studied were wet (with water within 10 cm of the surface) for at least a quarter of the year (Table 3), but in the very dry year 1975–76 only group A is appreciably wet. In the intermediate years groups K, I and L are noticeably dry. Group A is wettest probably because it is adjacent to a dammed dyke, which remains wet for much of the summer; in contrast, the dyke on the north side, adjacent to group B, is free-flowing and allows drainage, giving a similar mean water table depth but with much more variation. In Table 4 mean monthly changes in water table values have been regressed on the net precipitation (P–E) and the initial level of the water table for each month, in each vegetation group. Values are for the standardized partial regression coefficients, and their ratio indicates the relative importance of P-E and water table depth (WT) in controlling water table. WT is less important in the centre than on the margins, where drainage is possible, particularly on the north margin (pipes 14–17). It is also important in group K (pipes 7–8), which occupies the peak of the dome, and this strongly suggests that water tends to move sideways out of this dome, despite the very low horizontal hydraulic conductivity of peat (Rycroft, Williams and Ingram, 1975).

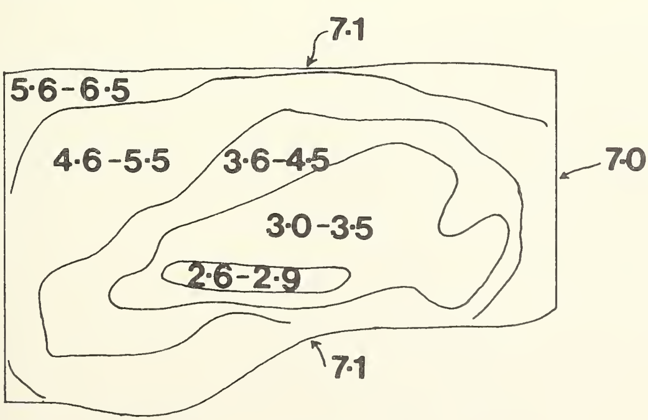

FIGURE 6

Contours of pH in Far Wood, October 1978.

TABLE 5

Seasonal variation in pH in a transect of water table pipes. Minimum, mean and maximum pH values are given, with the range recorded. Roman numerals indicate the month in which minima or maxima were recorded.

Pipe numbers	*Vegetation group*	*Min*	*Mean*	*Max*	*Range*
S. Dyke		5.2 iii	6.5	7.5 v	2.3
1–2	A	4.3 iii	6.1	7.2 xi	2.9
3–4	G	3.0 iii	5.1	6.6 x	3.0
5–6	J	2.6 iii	4.2	6.1 x	3.5
7–8	K	3.0 ii/iii	4.1	5.4 vi	2.4
9–10	J	2.5 iii	4.0	6.3 vi	3.8
11	I	3.5 iii	4.9	6.0 v	2.5
12–13	L	3.6 iii	5.5	6.8 x	3.2
14–15	C	4.5 iii	5.9	6.9 x	2.4
16–17	B	4.8 iii	6.1	7.2 v	2.4
N Dyke		6.2 iii	7.0	7.7 ii	1.5

Chemistry

Great variation in water-table pH occurs, both in time and in space. There is a generally concentric pattern of pH, with low values in the central, higher areas, approaching neutrality towards the margins (Fig 6). The values given are for October 1978 and do not indicate year-round fluctuations, which may be of the order of 2–3 pH units at a single point, the lowest values typically being recorded in early spring, the highest in late autumn (Table 5). Nevertheless the spatial gradients persist throughout the year, and changes of 2–3 pH units over distances of 20–30 m are usual.

The distribution of calcium and sodium appears to follow a similar pattern to pH, but those of phosphorus and potassium are markedly different. These data and a discussion of their possible significance will be presented in a later paper.

Discussion

The major discontinuity between the two vegetation types — fen and acid woodlands — can be explained by their topographical positions, which is clearly further reflected in pH (Fig 6). Both the raising of the peat dome and the changes in pH are almost certainly the result of *Sphagnum* growth, as the distribution of all three species is well correlated with these two factors. It is tempting, therefore, to explain the variation in successional terms. A simple explanation would regard the successional sequence as following the vegetation types in order of topographic height. However, this produces anomalies, such as the appearance of *Sphagnum* in groups A, G and L but its absence from Group I which is higher. Group H shows signs of being intermediate between the fen groups A–F and the extremely acid J and K, but groups I and L have abundant *Rubus fruticosus* and little or no *Sphagnum*. In addition they have more *Quercus* than adjacent types and examination of the soil reveals a highly humified leaf litter, resembling mull humus rather than peat. Groups L and I then do not appear to lie on the main successional sequence (Fig 7) which involves colonization by *Sphagnum* spp., the raising of the ground surface by 20–30 cm, and the evolution of a species-poor community, ultimately almost monospecific in each layer: *Betula pubescens*, *Molinia caerulea*, and *Sphagnum palustre* (group K). This appears to be a stage of raised bog (ombrotrophic mire) development, suggested by Walker (1970) to be the normal hydrosere in Britain, and accords with the existence of raised bog here in early historic times, since destroyed by peat-cutting (Hall *et al*, in Fitter and Smith, 1979).

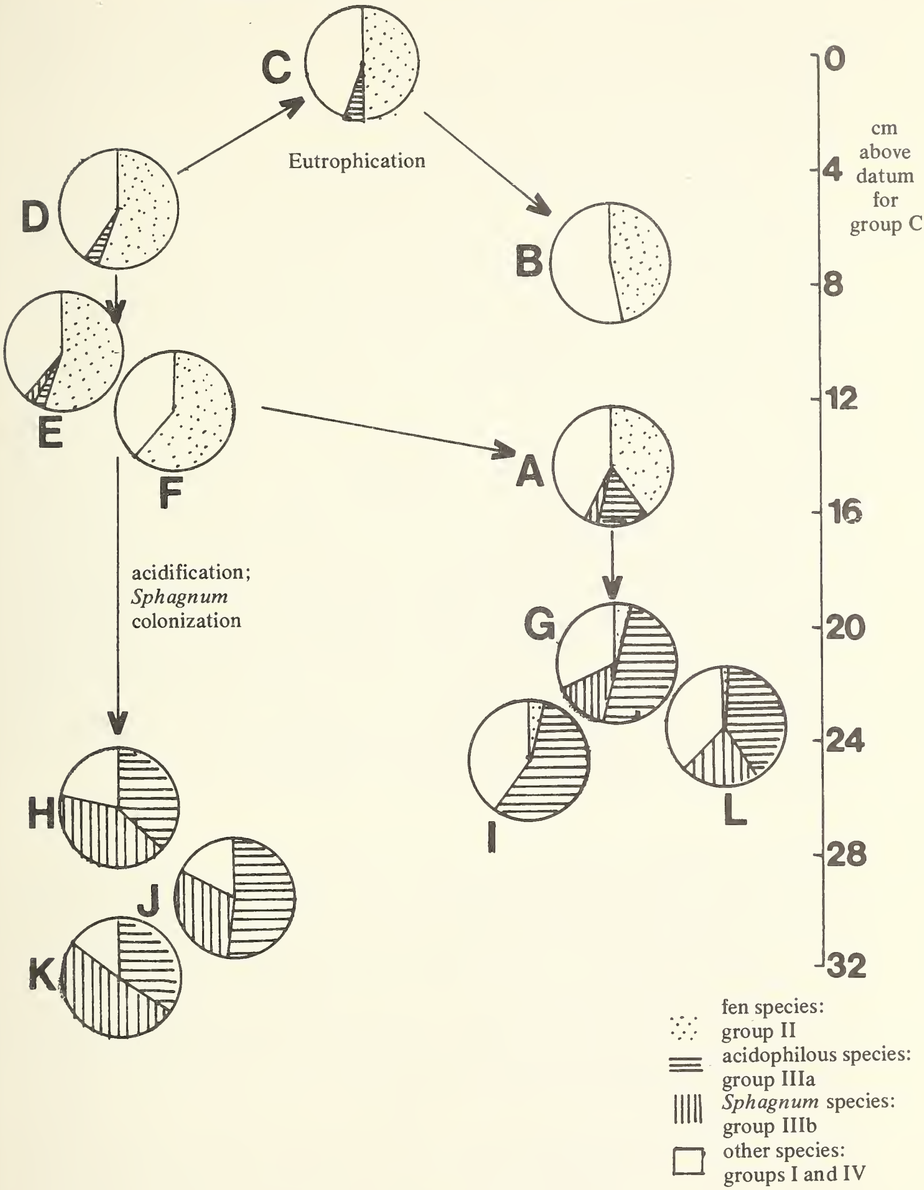

FIGURE 7

Schematic representation of suggested successional pathways in Far Wood. Groups are arranged according to topography; arrows represent possible routes of change. Sectors of circles refer to the mean percentage frequency of plants from the groups of species used in Table 1 to delineate the vegetation groups.

The growth of the peat-dome is of particular interest, in the light of the current rainfall of the area (around 600 mm yr^{-1}). Although ombrogeneous mire formation has occurred historically in eastern England (Holme and Woodwalton Fens, for example, as well as Askham Bog), Rose (1952) suggested that 1000 mm yr^{-1} was necessary. It remains to be seen whether further development can occur at current rainfall levels and whether typical ombrogenous mire species of *Sphagnum* will invade.

The *Rubus-Quercus* group (L and I) seem not to fit with this scheme, for they have been little colonized by *Sphagnum*, though partially raised. Hydrologically they resemble the semi-ombrotrophic group K, but there is little or no *Sphagnum* and a much more vigorous oak canopy has developed, with a well-developed shrub layer (I has much *Corylus* and *Crataegus monogyna). Molinia* is markedly less abundant on the ground and some species of the fen communities persist in small quantity: *Calamagrostis*, both *Lysimachias*, *Poa trivialis*, and *Solanum dulcamara*, for example. The major distinguishing feature, however, is the dominance and constancy of *Rubus fruticosus* in the ground layer.

This resembles the hydrosere described by Tansley (1939) for eastern England, culminating in oak forest, suggesting that some factor must have acted to prohibit the establishment of *Sphagnum* and the initiation of the alternative and co-existing sere. Since the whole area has been cut for peat in the past (Fitter and Smith, 1979), some historical factor could be involved, as at Woodwalton Fen (Poore, 1956). Alternatively tree-felling may have affected the vegetation. Far Wood was clear-felled in the 1890s, and in 1927 the birches were removed from the area now approximately occupied by vegetation group K (see Fig 2; Day, 1933). That part was then, however, already the area with most *Sphagnum*, though it is clear from Day's description that it maintained a much richer ground flora. The dominance of *Molinia* is a recent phenomenon, perhaps associated with increased aeration following a general lowering of the local water table: certainly the current water regime (Fig 5, Table 3) is apparently suitable for *Molinia* (Webster, 1962; Sheikh, 1970).

It appears then that in the regeneration of the cut peat surface in 250 or so years since peat-cutting ceased at Askham Bog, two quite distinct successional sequences may have been initiated — one possibly ultimately leading to an ombrotrophic mire and one to oak woodland (Fig 7). The cause of this divergence is not established, and it is rarely possible to be certain of the effects of historical factors; there is some evidence that the distribution of phosphate and potassium in the ground water may be linked with this problem of an apparently divergent climax. This will be explored in a later paper.

Summary

(1) Floristic analysis of the vegetation of Askham Bog, a small valley mire near York, reveals that two basic types of woodland occur — base-rich and base-poor. Each type is further subdivided into six groups.

(2) The relationships of these groups to standard phytosociological associations, particularly the *Osmundo-Alnetum* and the *Carici elongatae-Alnetum*, are discussed.

(3) It is shown that the acid woodlands occupy the peak of a dome with associated differences in water pH and hydrology.

(4) The successional trends are discussed. It is suggested that the main process is leading to the development of a *Sphagnum*-dominated community, but the possible existence of a second pathway, leading to dry oakwood, is examined.

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THE BOTANICAL RECORDS OF WILLIAM PILKINGTON OF HATFIELD (1758–1848)

P. SKIDMORE

Among the many by-products of concerted research into past naturalists of the Doncaster district being undertaken by the Doncaster Naturalists' Society and the Natural History staff of Doncaster Museum, one of the more interesting has been the unearthing of sources of records lying in archives and obscure journals. Of these the material relating to William Pilkington is of particular local significance since his records contribute considerably to our knowledge of the flora of the Hatfield area in the late eighteenth century. Indeed, the present list, which includes all of Pilkington's known Yorkshire records, in conjunction with the more extensive one from Thomas Tofield of Wilsic (1730–79) (Skidmore *et al*, 1980), provides a valuable picture of the flora of the Doncaster district at the time of the land enclosures. During that time, when areas of natural vegetation were being destroyed without a thought for conservation, it is most fortunate that there were those like Pilkington and Tofield carefully recording their discoveries. These records focus attention upon those elements of the local floral communities which remain as relics from those times and hence are invaluable in formulating conservation priorities today. Pilkington's records show that the present plant communities found in such restricted areas as Hatfield Lings and the Station Wood at Barnby Dun include species which once covered a much wider area around Hatfield. They suggest that a sandy heathland reserve centred on one or other of these sites would be highly desirable from a conservation viewpoint.

Just as the lists of Pilkington and Tofield amount to a very impressive early Flora of the Doncaster area, so too do the extant lists of three later botanists for the Rotherham district.

These three are George P. Nicholson (fl 1830s) a Wath solicitor and author of *Indigenous Botany* (1831), Larrett Langley (1801–54) lecturer at the Brampton Academy and author of *Flora of Rotherham* (1828), and Benjamin Bowers Le Tall, formerly of Woodhouse, Sheffield and later of Hobart, Tasmania (fl 1860–1902). Le Tall's manuscript (1871–74) in the Newbould Collection at the British Museum (Nat Hist.) is a particularly long and exhaustive list covering the Rother Valley and the adjacent Coal Measures and Magnesian Limestone areas.

William Pilkington was born at Hatfield on 7 September 1758, the elder son of William Pilkington senior, and Elizabeth, daughter of William Baker of Tadcaster. He became a pupil of the London architect Sir Robert Taylor and achieved considerable distinction in his chosen career (Smith MSS, Doncaster Museum). One of his major early works was occasioned by Taylor's death in 1788 when, employed as surveyor and architect to the Earl of Radnor at Salisbury, he built the Town Hall there from Taylor's designs. This occupied Pilkington for the next nine years and he seems to have spent much of his spare time botanizing around Old Sarum and Salisbury. During the same period, and perhaps throughout his working life, which was centred mainly on London, though with occasional commitments elsewhere (e.g. Portsmouth in 1785; Folkestone in *c*. 1800; Great Yarmouth in 1809–11), it appears that he made frequent return visits to Yorkshire. In June 1785 he married Sarah Andrews of Knaresborough, and most of his dated botanical notes relate to the 1790s.

Pilkington's professional achievements appear to have been quite extensive and are reasonably well-documented (see references), but very little seems to be known of his botanical interests. Dr William George Maton (1774–1835) apparently visited the Doncaster area and it is known that he was a friend of Pilkington, perhaps as a result of their mutual association with Salisbury, their similar natural history interests and their membership of the Linnean Society. Maton joined this society in 1794, Pilkington in 1795. Maton was born in Salisbury, son of George Maton, wine merchant, and was educated at Salisbury Grammar School, entering Queen's College, Oxford in July 1790. It was through Dr John Sibthorp that he joined the Linnean Society, but he had already become a well-known figure in intellectual circles in Salisbury and would no doubt have met or heard of William Pilkington, then busy building Salisbury Town Hall. In any case Pilkington evidently co-operated in the botanical survey work which occupied the botanical fraternity of the Linnean at this time and which led to the publication of Turner and Dillwyn's *Botanists' Guide* (1805).

Rev William Wood (1745–1808) of Leeds, another prominent botanist of the Linnean Society, joining in 1791, refers to, but omits to identify, the 'best botanist in that [Doncaster] neighbourhood', in his comment on *Peucedanum palustre* (Lees, 1888). He was questioning Tofield's record of this plant by claiming that this unnamed botanist had never seen it in that area and believed that Tofield's specimen had 'come from a distance'. It is almost certain that this person was William Pilkington for his notebook shows that he had no record of the plant. However, the veracity of Tofield's record is beyond question. Indeed his was the first British record of the species and it was confirmed by William Hudson. Moreover it was seen and collected in the area around Doncaster by numerous botanists right up to the 1940s.

Although Pilkington's records are very valuable and his identifications need not be questioned, he was clearly not such a systematic and critical observer as Tofield, and he showed no particular flair for Umbellifers as Tofield certainly did. In short he would probably not have recognized *Peucedanum palustre* if he had fallen over it! He had evidently never picked a specimen and identified it: certainly it was not represented in his herbarium.

Britten and Boulger (1931) note that Pilkington had a herbarium and that he contributed to Smith and Sowerby's *English Botany* (1790 onwards). The records given here are from a manuscript in the Newbould Collection in the Department of Botany, British Museum (Nat. Hist.). Comprising 285 pages, this manuscript, which has Pilkington's bookplate on the inside front cover, is a list of British plants together with descriptions and records from his herbarium specimens in the margins. It is written in a very clear, neat hand and probably passed into Newbould's possession from Richard Irwin Lynch, Curator of the Cambridge Botanic Garden, for there is also a very rough transcription running to some forty

pages merely giving Pilkington's records. This is the work of Newbould himself for he gives the following heading 'William Pilkington's Stations for British Plants extracted from a MS. British Flora without title now (February 1881) belonging to Mr. Lynch, Curator of Botanic Gardens, Cambridge and written with his permission.' The present location of Pilkington's herbarium has not been traced, but his specimens are probably extant amongst material of some of his contemporaries.

William Pilkington had two sons, Henry, of Park Lane House, near Doncaster, an assistant poor law and tithe commissioner, and Redmond William, who followed in his father's profession, succeeding him in many of his commitments (such as his work for the Earl of Radnor). There is no indication that either of his sons inherited his love of botany.

Pilkington's list of plant records includes many from areas outside Yorkshire (especially from Wiltshire). In the following transcription, however, only those from Yorkshire and adjoining counties are included. Unfortunately very few dates are given in Newbould's copy but it appears that all refer to the period 1790–1816. Pilkington's notebook was written in a mature but not obviously aged hand.

The List

Epimedium alpinum L. Hutton's Garden at Keswick

Papaver rhoeas L. Sandy cornfields at Hatfield

P. argemone L. Sandy cornfields at Hatfield (N.B. According to Lees (1888) this was later found at Hatfield by George Roberts of Lofthouse)

P. somniferum L. Cornfields by Thoresby Park, Notts.

Chelidonium majus L. Hedgesides leading into Hatfield from Doncaster

Meconopsis cambrica (L.) Vig. In the copse near Ferry House, Windermere

Reseda luteola L. Fields and lanes about Hatfield

Silene nutans L. On the rocks at Knaresborough (N.B. Archdeacon Pierson records it from here in Turner & Dillwyn, 1805)

Agrostemma githago L. Cornfields at Hatfield Woodhouse

'Dianthus glaucus' On the walls of Tickhill Castle (NB. This is presumably *D. plumarius* L., which Tofield found at this site)

Cerastium arvense L. By springs on the rocks near Burlington Quarry, Yorks

Stellaria graminea L. West Moors at Hatfield

S. alsine Grimm. Harrowgate Common

Moehringia trinervia (L.) Clairv. Castleton in Derbyshire

Arenaria serpyllifolia L. Walls of Tickhill Castle

'A. laricifolia' Rocks at Castleton, Derbyshire. (NB. Presumably this is *A. verna* Bartl., see Lees, 1888)

Spergularia rubra (L.) J. & C. Presl. On the Lings, Hatfield Park

Spergula arvensis L. Sandy cornfields at Hatfield

Montia fontana L. Harrowgate Common and Mount Skiddaw

Euonymus europaeus L. Hedges in Park Lane, Hatfield, 1816

Frangula alnus Mill. Grove at Hatfield

Filipendula ulmaria (L.) Maxim. In a grove at Parkhill (i.e. near Hatfield)

Rubus idaeus L. Hedges in the Cocktree Closes at Hatfield

Potentilla palustris (L.) Scop. Hatfield Moors

P. erecta (L.) Räusch. Turf moor at Hatfield

Agrimonia eupatoria L. Ash Tree Lane, Hatfield

Alchemilla vulgaris L. agg. About Castleton and Eyam in Derbyshire

Aphanes arvensis agg. (incl. *microcarpa*) Hatfield Lings

Sanguisorba officinalis L. My father's close at Hatfield

Rosa canina L. Near the Stone Inn at Richmond and Woods at Ingleton

R. villosa L. In a wood upon the rocks near Ingleton, Yorkshire

Crataegus monogyna Jacq. Hedges everywhere

Sorbus aucuparia L. Hackfall Woods in Yorkshire; Hatfield in the hedges

Sedum album L. Lancashire side of Windermere
Sempervivum tectorum L. On a wall in the village near Parkhill
Saxifraga stellaris L. On Mount Skiddaw
S. granulata L. Mam Tor in Derbyshire
S. hypnoides L. Rocky hills at Castleton, Derbyshire, Rocky hills at Ingleton
'S. autumnalis' At the foot of the mountain Helvellyn between Arnside and Keswick
Parnassia palustris L. Moist meadows near Dunscroft at Hatfield
Peplis portula L. Moist places on Thorne Common
Epilobium adnatum Griseb. (sub nom. *tetrapterum)* Sides of ditches near Hatfield (NB. Earliest West Yorkshire record in Lees (1888) is from George Harrison, 1862)
E. palustre L. Ditches about Hatfield (NB. Earliest West Yorkshire record in Lees (1888) is Baines, 1840)
Circaea lutetiana L. Woods at Sandbeck in Yorkshire, 4 July 1794
C. alpina L. Rocky woods on the Lancashire side of Windermere, 21 July 1799
Heracleum sphondylium L. My Father's Dunscroft below Hatfield
Daucus carota L. Hedges about the fields at Hatfield
Conium maculatum L. Hedges in the fields about Hatfield
Conopodium majus (Gouan) Loret Roche Abbey Woods
Sium latifolium L. Marshy ground on Hatfield Common near Garden Stead Closes
Chaerophyllum temulentum L. Hedges in the fields about Hatfield
Polygonum bistorta L. Fountains Abbey
P. amphibium L. Ditches near my close at Hatfield
P. hydropiper L. Corn closes at Hatfield
P. persicaria L. Corn closes at Hatfield
'P. pennsylvanicum' Cornfields at Hatfield
P. aviculara L. Cornfields at Hatfield
P. convolvulus L. Cornfields at Hatfield
Rumex conglomeratus Murr. Ditches near Dunscroft at Hatfield (NB. Earliest West Yorkshire record)
R. acetosella L. Sandy cornfields at Hatfield Woodhouse
Daphne laureola L. Roche Abbey Woods
Calluna vulgaris (L.) Hull Lings, Hatfield
Erica tetralix L. West Moors at Hatfield
E. cinerea L. West Moors at Hatfield
Vaccinium myrtillus L. Blackstone Edge 19 July 1799
V. vitis-idaea L. Bogs on Ingleborough
V. oxycoccus L. Turf bogs near Hatfield, bogs on Ingleborough
Andromeda polifolia L. Turf bogs at Hatfield
Pyrola rotundifolia L. Hackfall Woods, Yorkshire
Monotropa hypopitys L. agg. In the wood opposite the Inn at Matlock
Primula farinosa L. Moist woods and rocks about Ingleton
Hottonia palustris L. Ditches on the West Moor, Hatfield
Lysimachia nemorum L. Grove at Parkhill, rocky soil
L. nummularia L. Moist meadows at Hatfield
Anagallis tenella (L.) L. On the West Moor, Hatfield
Vinca minor L. Woods at Roche Abbey
Gentiana pneumonanthe L. In the Whin brushes between the West Moors and the Lings Hatfield (NB. Dr. Maton's record in Turner and Dillwyn (1805) probably refers to same locality)
Blackstonia perfoliata (L.) Huds. Near the Doncaster Brick Kiln
Cynoglossum officinalis L. Lanes at Hatfield
Anchusa arvensis (L.) Bieb. Sandy cornfields at Hatfield
Lithospermum officinale L. Grass at Parkhill on a rocky soil
Echium vulgare L. Cornfields at Hatfield, on Tickhill Castle walls (NB. According to Lees (1888) this was later taken at Hatfield by George Roberts)

Hyoscyamus niger L. Roadsides at Hatfield

Verbascum blattaria L. On the walls of Tickhill Castle (NB Dr Maton records it from this site in Turner and Dillwyn, 1805)

Pinguicula vulgaris L. Lane between Boothferry and Weighton in Yorkshire; in a moist ditch West Moor, Hatfield

Salvia verbenacea L. Hills near the Abbey at Knaresborough June 1796

Plantago media L. Lane near Dunscroft at Hatfield

Campanula rotundifolia L. Parkhill, Yorkshire

Galium palustre L. Moist meadows at Sheffield

G. uliginosum L. Furze brushes on the Lings, Hatfield

G. boreale L. Left of the bridge on the stones in the bed of the river leading into Kirby Lonsdale

G. odoratum (L.) Scop. Woods at Parkhill

Viburnum opulus L. In a copse by Gibbes Dike Lane between Cave and Howden

Lonicera periclymenum L. Thickets at the side of West Moors at Hatfield

Valerianella locusta (L.) Betcke. Meadows about Hatfield 22 June 1795

Knautia arvensis (L.) Coult. Moist meadows at Hatfield

Succisa pratensis Moench. Moist meadows at Hatfield

Alisma plantago-aquatica L. Parkhill

Potamogeton natans L. In a pond near Sandbeck

P. gramineus L. River at Parkhill, Yorkshire

Narthecium ossifragum (L.) Huds. Sides of West Moor next to the Lings at Hatfield

Convallaria majalis L. Wood at Matlock. Woods at Hackfall near Ripon

Polygonatum multiflorum (L.) All. Woods at Fountains Abbey

Juncus squarrosus L. West Moor at Hatfield

Eriophorum angustifolium Honck. Barmby Moor, 20 June 1795

E. vaginatum L. Turf bogs at Hatfield, June 1796

Rhynchospora alba (L.) Vahl. Turf bogs near Hatfield 9 August 1790 (NB. According to Lees (1888) this was rediscovered on Hatfield Moor by Dr H. F. Parsons in 1878)

Eleocharis palustris (L.) Roem. and Schult. In the water at Parkhill, Yorkshire, July 1794

Bromus sterilis L. Fields at Hatfield

Lolium perenne L. Mr Gossip's fields at Hatfield

Dactylis glomerata L. Fields at Hatfield

Cynosurus cristatus L. at Hatfield

Apera spica-venti (L.) Beauv. Sandy cornfields at Hatfield (NB. Earliest West Yorkshire record known to Lees was that of Rev H. Davies for 'near Doncaster' in Turner and Dillwyn, 1805)

Agrostis stolonifera L. Fields at Hatfield

'A. capillaris' Fields at Hatfield

Phragmites communis Trin. Sandbeck Woods, Yorkshire

Phleum pratense L. Meadows about Hatfield

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NOTES ON YORKSHIRE MOLLUSCA — 1
BOETTGERILLA PALLENS SIMROTH IN YORKSHIRE

A. NORRIS

Leeds City Museum

In 1973 Dr B. Colville, Dr L. Lloyd-Evans and myself described the occurrence of *Boettgerilla pallens* Simroth in the English Lake District, this being the first record of this species for Britain.

Since that date it has been recorded from fourteen localities in eleven counties, as follows: Cornwall, Hampshire, Surrey, Herefordshire, Glamorgan, Leicestershire, Cheshire, Westmorland, Jersey in The Channel Islands, and two Irish counties, Co Down and Co Antrim.

This species, like many of the previous species introduced by man into Britain, is, therefore, spreading fairly rapidly. It is important to note the occurrence of this slug in areas in which it has not been previously recorded, so that we can follow its spread throughout Britain.

On several dates in 1979 Dr Colville, who lives in the West Park area of Leeds, reported that he had found specimens of *Boettgerilla* in his own garden. It must be presumed that he accidentally introduced the slugs or their eggs into his garden with soil and litter collected from the original site at The Abbey, Windermere. There is little doubt, however, that the slug has become established in his garden and is spreading to others in the area. For this reason it is particularly important to record its occurrence in gardens in the West Park area of Leeds.

This species, therefore, must be considered as a resident, and as such should be placed on the Yorkshire list.

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THE 1978–79 SURVEY OF HERRING GULL *(LARUS ARGENTATUS)* COLONIES ON THE YORKSHIRE AND CLEVELAND COAST

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INTRODUCTION

Herring Gulls nest along almost all of the east coast of England and the only large gap in their distribution is the coastline between Bridlington, Yorkshire and Orfordness, Suffolk. However, the major concentrations occur on the coast of Yorkshire and the southern part of Cleveland, where the gulls nest both on seacliffs and on buildings in coastal towns. North of Saltburn (Cleveland) Herring Gulls do not nest for 43 km (that is, Sunderland), and from the River Tees to the Scottish border there are only about 600 pairs of breeding Herring Gulls (J. C. Coulson, *pers comm*).

HISTORY

The first detailed record of Herring Gull colonies on the Yorkshire and Cleveland coasts was in 1907 when Nelson reported Herring Gulls nesting on cliffs between Saltburn and Robin Hood's Bay; between Gristhorpe Cliffs and Filey; with colonies at Boulby, Staithes, Kettleness, and Whitby Highheights. There were also a few nests at Old Peak and Ravenscar, Burniston Bay, Speeton, and Dane's Dyke. Attempts to nest at Bempton, at that time, were prevented by egg collectors protecting the auk colonies.

Herring Gulls were first recorded nesting on rooftops in Whitby in 1942; Scarborough in 1967; Runswick in 1969 (B. T. Fewster, A. Wallis and W. Norman, respectively in Cramp, 1971); in Staithes, Cowbar and Robin Hood's Bay in 1947 (Chislett, 1953); and in Fylingthorpe and Filey in 1976 (Monaghan and Coulson, 1977).

These town and cliff populations were covered in a national census of seabirds, 'Operation Seafarer', in 1969–70, with the exception of the Runswick to Sandsend cliffs. The town populations were surveyed again in 1976, in a national census of gulls nesting on buildings in Britain and Ireland (Monaghan and Coulson, 1977). The data from these two surveys have been included in this paper for comparison with the 1978–79 counts.

METHODS

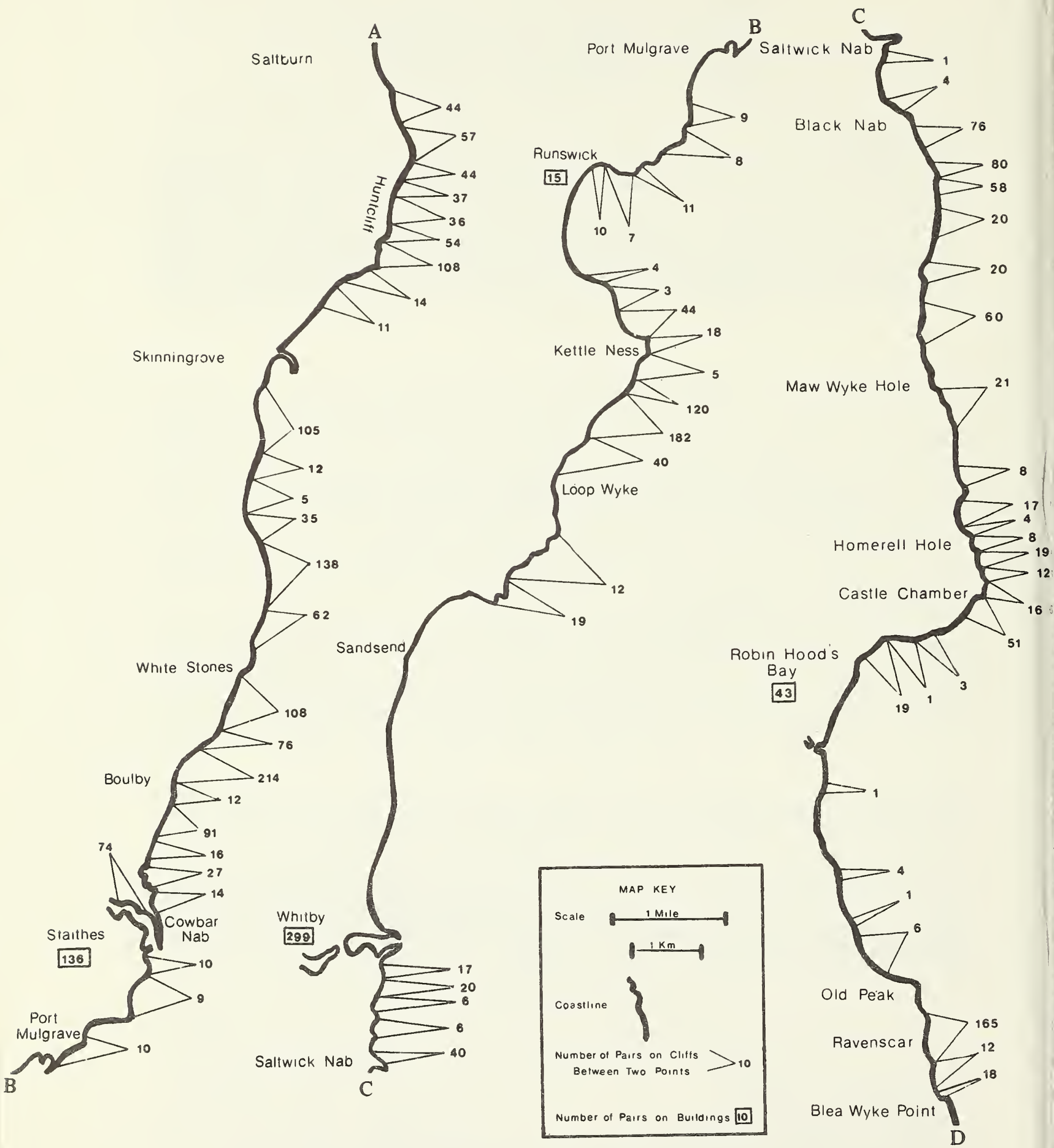
The cliffs from Saltburn to Filey, and Gull Nook to Bridlington were surveyed by MCML, the towns were surveyed by SVK, and the cliffs from Speeton to Gull Nook by CW.

Due to the distances involved, and the difficulty of access to the shore under some of the cliffs, this survey was carried out over two breeding seasons, 1978 and 1979. The towns were censused from the ground, and from overlooking buildings and high ground. Cliff breeding Herring Gulls were counted from beneath the cliffs where possible, and from the clifftops otherwise, as detailed in Table 1.

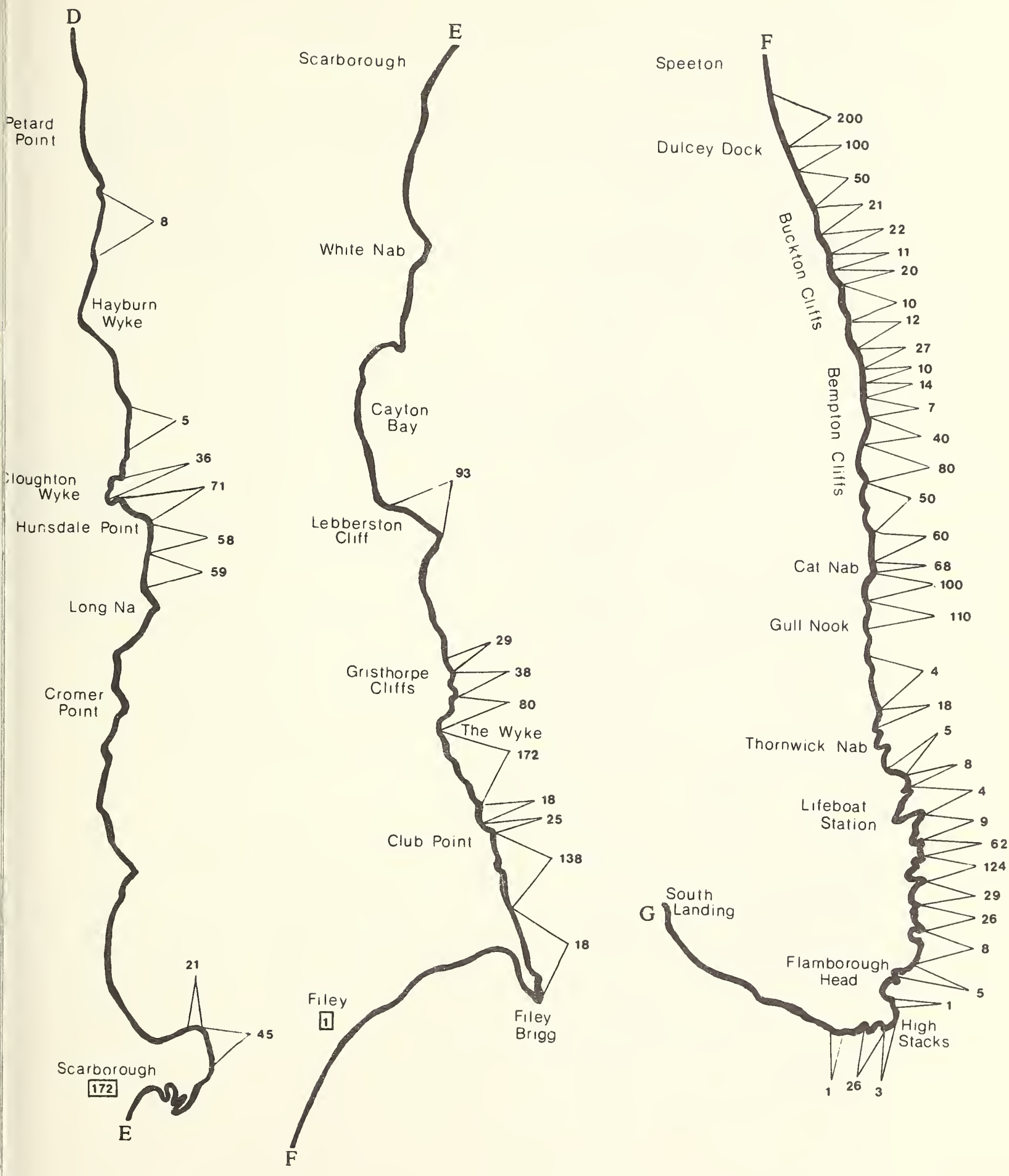
TABLE 1

The position from which cliffs were viewed

Below cliffs	*Above cliffs*
Saltburn to Port Mulgrave	Port Mulgrave to Lingrow Knock
Lingrow Knock to Loop Wyke	Loop Wyke to Whitby
Whitby to lighthouse near Black Nab	Lighthouse to Maw Wyke Hole
Maw Wyke Hole to south end of Ravenscar	Ravenscar to Cromer Point
Cromer Point to Cayton Bay	Cayton Bay to Bridlington



A
Saltburn
44
57
Hunicliff
44
37
36
54
108
14
11
Skinningrove
105
12
5
35
138
62
White Stones
108
76
Boulby
214
12
91
74
16
27
14
Cowbar Nab
Staithes
136
10
9
Port Mulgrave
10
B
B
Port Mulgrave
9
Runswick
15
8
11
10
7
4
3
44
18
Kettle Ness
5
120
182
40
Loop Wyke
12
19
Sandsend
Whitby
299
17
20
6
6
40
Saltwick Nab
C
C
Saltwick Nab
1
4
Black Nab
76
80
58
20
20
60
Maw Wyke Hole
21
8
17
4
Homerell Hole
8
19
12
Castle Chamber
16
51
Robin Hood's Bay
43
3
1
19
1
4
1
6
Old Peak
165
Ravenscar
12
18
Blea Wyke Point
D
MAP KEY
Scale
1 Mile
1 Km
Coastline
Number of Pairs on Cliffs Between Two Points
10
Number of Pairs on Buildings
10


D
Petard Point
8
Hayburn Wyke
5
36
Cloughton Wyke
71
Hunsdale Point
58
59
Long Na
Cromer Point
21
45
Scarborough
172
E
E
Scarborough
White Nab
Cayton Bay
93
Lebberston Cliff
29
Gristhorpe Cliffs
38
80
The Wyke
172
18
25
Club Point
138
18
Filey
1
Filey Brigg
F
F
Speeton
200
Dulcey Dock
100
50
21
Buckton Cliffs
22
11
20
10
12
27
10
14
Bempton Cliffs
7
40
80
50
60
Cat Nab
68
100
Gull Nook
110
4
18
Thornwick Nab
5
8
4
Lifeboat Station
9
62
124
South Landing
G
29
26
8
Flamborough Head
5
1
High Stacks
1
26
3

ACCURACY OF COUNTS

Most cliff colonies were censused only once, but certain easily accessible areas censused in 1978 were counted again in 1979 to check the extent of yearly fluctuations of the nesting population. On the cliffs, nests were found mainly on rock ledges, with some on grassy slopes well out of human reach. Cliff faces were clearly visible from their bases, with only a few potential nesting sites obscured by tall grass or rocks. Less complete cover of the cliff faces was obtained from the clifftops.

The large town colonies of Staithes, Whitby and Scarborough were subjects of detailed surveys, with observations extending from early May to late June. The smaller town colonies were visited on more than one occasion. The most common types of town nesting sites were the centre of a double row of chimney pots, dormer windows, and other flat areas, often next to something vertical.

The number of breeding pairs were minimal counts, and included visible nests; groups of chicks; and in towns, sites where either a bird was protecting a territory area over a prolonged period, or nesting material was taken.

TABLE 2
Number of pairs of Herring Gulls nesting on cliffs from surveys in 1969–70, and 1978–79

Location	*1969*	*1970*	*1978*	*1979*	*1969–70 to 1978–79 change per annum*
Saltburn to Skinningrove	259		405	325	+2%
Skinningrove to Staithes and Cowbar	757		989		+3%
Staithes to Port Mulgrave	15		29		+8%
Port Mulgrave to Runswick	135		45		−13%
Runswick to Sandsend	(340)†		447		(+3%)
Whitby to Robin Hood's Bay		200 ± 10	587		+14%
Robin Hood's Bay to Old Peak	*			12	*
Ravenscar	200 ± 10			195	−0.3%
Petard Point to Cloughton Wyke	*			13	*
Cloughton Wyke	68 ± 10			107	+5%
Hunsdale Point to Scarborough	50 ± 2			117	+9%
Castle Cliff, Scarborough	60 ± 10			66	+1%
Lebberston Cliffs to Filey Brigg	281			611	+8%
Red Cliff to Flamborough	1275			1345	+0.5%
Mean					+3.3%

†Not surveyed in 1969–70, but as a value was required for Table 4 this was calculated using the mean annual growth rate.

*Not surveyed in 1969–70.

TABLE 3
Number of pairs of Herring Gulls nesting on buildings, from the 1969–70, 1976, and 1978–79 surveys

Location	*1969*	*1970*	*1976*	*1978*	*1979*	*Growth rate per annum*			
						1969–70 to 1976	*1976 to 1978*	*1976 to 1979*	*1969–70 to 1978–79*
Staithes and Cowbar		3	78	136		72%	32%		61%
Runswick	2		0	15					—
Whitby	97		200+	299		11%	22%		13%
Robin Hood's Bay and Fylingthorpe	3+		31	43		40%	18%		34%
Scarborough	4		120		172	63%		13%	46%
Filey			5	1	1				—
Mean						22%	22%		22%

TABLE 4
A comparison of Herring Gull populations nesting on buildings and cliffs from the 1969–70 and the 1978–79 surveys (taken from the data in Tables 2 and 3)

	1969–70	*1978–79*	*Mean annual rate of growth*
Number of pairs on cliffs	3640	4969	3%*
Number of pairs on buildings	109	666	22%†
Total	3749	5634	4%
Percentage in towns	3%	12%	

*Taken from Table 2.
†Taken from Table 3.

TABLE 5

Numbers of Herring Gull pairs nesting on particular cliff areas censused in both 1978 and 1979, and compared with counts from 1969

Location	*1969*	*1978*	*1979*	*Percentage change per annum* 1969 to 1978	1978 to 1979	1969–70 to 1978–79
Saltburn to Skinningrove	259	405	325	+5%	−20%	+2%
Bias Scar to Cowbar		41	63		+54%	
Cowbar Cliffs		74	101		+36%	
Cloughton Wyke	68 ± 10	78	107	+2%	+37%	+5%
Castle Cliff	60 ± 10	41	66	−4%	+61%	+1%
Total	387*	639	662	+7%*	+4%	+6%*

*This value does not include areas 2 and 3, as these areas were not detailed in the 1969–70 survey.

RESULTS

The distribution of nesting Herring Gulls in the 1978–79 census along the Yorkshire and Cleveland coast, between Saltburn and Bridlington, is shown in Fig 1. These data are presented along with observation dates in Appendix 1. Major concentrations of breeding pairs were found at Huntcliff, near Saltburn; between Skinningrove and Staithes; at Kettleness; between Whitby and Robin Hood's Bay; at Ravenscar; Cloughton Wyke and Hunsdale Point; Scarborough; Lebberston Cliffs; between Gristhorpe Cliffs and Filey Brigg; and between Speeton and Flamborough Head.

Comparison of the cliff populations with the data from the 1969–70, and 1977 surveys showed that these populations had been growing at a mean rate of 3 per cent per annum since 1969 (Table 2).

The number nesting on buildings, compared with those of the previous surveys, showed a mean annual growth rate of 22 per cent over the last ten years, with the exceptions of Runswick and Filey where the nesting populations were not yet established (Table 3).

The mean annual rate of increase for the whole coast was 4 per cent over the last ten years.

Since the 1969–70 survey, the proportion of Herring Gulls nesting on buildings rose from 3 per cent of the total population, censused along the Yorkshire and Cleveland coast, to 12 per cent in 1978–79 (Table 4).

The number of nesting pairs of Herring Gulls along five areas of the cliffs, censused both in 1978 and 1979, and compared with the two previous surveys, showed a mean increase of 44 per cent from 1978 to 1979, with the exception of the Saltburn to Skinningrove cliffs, which decreased by 20 per cent (Table 5). Although all the areas showed such great annual variation in numbers, each showed a small mean annual rate of increase over the last ten years. The combined percentage change for the five areas between 1978 and 1979 of +4 per cent differed little from the mean annual rate for the ten years of +6 per cent, suggesting that the large annual variation in each area may have been due to movement of pairs between years.

DISCUSSION

The 1978–79 census of Herring Gulls found 5634 pairs nesting on the seacliffs and in coastal towns in Yorkshire and Cleveland, as compared to 3749 in 1969–70, a mean rate of increase of 4 per cent per annum.

Of the 5634 pairs, 12 per cent were nesting on buildings, whereas in 1969–70 only 3 per cent of the total number of pairs did so. This increase is explained by the fact that over the last ten years the mean annual rate of increase has been only 3 per cent on the cliffs, as compared to 22 per cent in the towns. The difference in these rates of increase may have been due to the saturation of suitable nesting sites on the cliffs, and the abundance of unoccupied sites on buildings in the towns.

Cliff populations censused both in 1978 and 1979 showed wide yearly fluctuations of at least 20 per cent, although over ten years they increased by less than 6 per cent per annum. The yearly fluctuations may have resulted from either, variations in the number of breeding adults each year, or pairs moving their site of nesting between years, although more data would be required to test either hypothesis.

SUMMARY

A census of nesting Herring Gulls along the coast of Yorkshire and Cleveland was conducted in 1978 and 1979.

Between Saltburn and Bridlington there were 5634 breeding pairs, 12 per cent of which were nesting on buildings.

Comparisons of this survey with the national surveys of 1969–70, and 1977, show that the town nesting populations were growing at a mean annual rate of 22 per cent over the last ten years, but only 3 per cent on the cliffs. The over-all annual rate of growth of the Yorkshire-Cleveland coastal colonies was 4 per cent.

The proportions of Herring Gulls nesting on buildings has increased from 3 per cent of the total in 1969–70, to 12 per cent in 1978–79.

Comparisons of surveys of five cliff areas taken in 1978 and 1979, and covered in the 1969–70 survey show that there are yearly fluctuations in numbers of pairs of at least 20 per cent, although over the ten years they increased by an average of less than 5 per cent per annum.

ACKNOWLEDGEMENTS

We would like to thank Dr J. C. Coulson for his advice and assistance with the writing of this paper. We would also like to thank the Royal Society for the Protection of Birds for allowing us to use their survey from Speeton to Gull Nook in 1978 in this paper, and the Environmental Health Department of Scarborough Borough Council for their co-operation.

During this work, S. V. Kearsey was supported by an SRC CASE Studentship.

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APPENDIX 1

Distribution of nesting Herring Gulls between Saltburn and Bridlington, on the Yorkshire and Cleveland coast, 1978–79

Location	*OS map ref*	*Observation date*	*Number of pairs*
Teesmouth to Saltburn			0
Saltburn to Huntcliff	NZ670217–NZ690218	23/6/78	182
Huntcliff to Seal Goit	NZ690218–NZ700217	22, 23/6/78	198
Seal Goit to Skinningrove	NZ700217–NZ711204	22/6/78	25
Skinningrove to White Stones	NZ711204–NZ748201	9/6/78	357
White Stones to Boulby	NZ748201–NZ764192	7/6/78	398
Boulby to Cowbar	NZ764192–NZ783191	21/6/78	160
Cowbar Cliffs	NZ783191–NZ781189	26/5/78	74

APPENDIX 1 *(continued)*

Location	*OS map ref*	*Observation date*	*Number of pairs*
Cowbar Buildings	NZ782189	21/6/78	15
Staithes Buildings	NZ782187	May–June/78	121
Staithes to Port Mulgrave	NZ785188–NZ799177	6/6/78	29
Port Mulgrave to Lingrow Knock	NZ799177–NZ809169	3/5/78	17
Lingrow Knock to Runswick	NZ809169–NZ810160	27/7/78	28
Runswick Buildings	NZ810160	3/5 & 4/7/78	15
Runswick to Kettleness	NZ810160–NZ832163	3/5 & 4/7/78	51
Kettleness to Loop Wyke	NZ832163–NZ848147	4/7/78	365
Loop Wyke to Sandsend	NZ848147–NZ860130	19/4/78	31
Sandsend to Whitby	NZ860130–NZ899116	5/7/78	0
Whitby Buildings	NZ900110	May–June/78	299
Whitby to Saltwick	NZ902115–NZ916114	5/7/78	89
Saltwick to lighthouse near Black Nab	NZ916114–NZ928103	7/7/78	219
Lighthouse to Maw Wyke Hole	NZ928103–NZ942084	19/7/78	100
Maw Wyke Hole to Homerell Hole	NZ942084–NZ957070	21/7/78	77
Homerell Hole to Robin Hood's Bay	NZ957070–NZ954048	20/7/78	102
Robin Hood's Bay Buildings	NZ951054	5/6/78	43
Robin Hood's Bay to Old Peak	NZ954048–NZ980024	12, 17/5/79	12
Ravenscar	NZ980024–NZ987017	13, 17/5/79	165
Ravenscar to Blea Wyke	NZ987017–NZ992015	14/5/79	30
Blea Wyke to Petard Point	NZ992015–TA006989	14/5/79	0
Petard Point to Cloughton Wyke	TA006989–TA021953	15/5/79	13
Cloughton Wyke	TA021953–TA026948	21/6/79	107
Hunsdale Point to Long Nab	TA026948–TA030940	21/6/79	117
Long Nab to Scarborough	TA030940–TA036906	16/5/79	0
Scarborough Buildings	TA042885	May-June/79	172
Castle Cliff, Scarborough	TA050895–TA053890	21/6/79	66
Castle Cliff to Osgodby Point	TA053890–TA065854	May/79	0
Osgodby Point to Yons Nab	TA065854–TA085843	24/5/79	93
Yons Nab to The Wyke	TA085843–TA100831	29/5/79	67
The Wyke to Filey	TA100831–TA119800	29/5/79	451
Filey Buildings	TA119800	29/5/79	1
Filey to Speeton	TA119800–TA150757	29/5/79	0
Speeton Gap to Dulcey Dock	TA150757–TA168748	25/6/79	200
Dulcey Dock to Buckton Cliffs	TA168748–TA182746	21/6/79	193
Buckton Cliffs to Bempton Cliffs	TA182746–TA193744	20/6/79	53
Bempton Cliffs to Gull Nook	TA193744–TA222727	12/6/79	566
Gull Nook to Lifeboat Station	TA222727–TA239720	12/7/79	39
Lifeboat Station to Stottle Bank Nook	TA239720–TA254713	12/7/79	258
Stottle Bank Nook to Head Farm	TA254713–TA252697	28/6/79	36
Head Farm to Bridlington	TA252697–TA194678	28/6/79	0

YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 1979

COMPILED BY A. NORRIS

Tophill Low (VC 61) (23 June) (B. S. Pashby)

Tophill Low is the site of two reservoirs on the west bank of the River Hull and is part of the huge expanse of carrs which once covered the whole of the River Hull valley. The Yorkshire Water Authority has tried to preserve as much of the area as possible and during the twenty years since the area was taken over, has created a variety of habitats for wildlife.

Thirty members attended the field meeting, twelve societies being represented. The weather was dry and bright with a strong breeze. Members spent the morning, under the guidance of Dr P. Izzard, in the areas surrounding the southernmost of the two reservoirs. After lunch, the party went further afield, north of the large reservoir and along the west bank of the River Hull.

After tea at Hutton Cranswick, the Rev B. Kitchen took the chair, when reports were presented. It was agreed that a letter be sent to the Yorkshire Water Authority acknowledging the efforts being made to preserve the wildlife of the area. Dr L. Lloyd-Evans proposed votes of thanks to Dr Izzard for his help and advice and to the divisional secretary for organizing the meeting.

Ornithology (B. S. Pashby)

Traditionally a very good marshy area, Tophill Low retains some of its wetland birds. Mallard, Shoveler and Gadwall had all bred and were seen from the hide at the south marsh, as well as Teal, Tufted Duck and Coot. A pair of Shelduck was also thought to be breeding, but the nesting site was not known. The waterside vegetation of the River Hull held some Sedge Warblers and a few pairs of Reed Warblers.

Of woodland birds, a male Blackcap was in fine song near the entrance to the site and at least two others were heard. A Whitethroat was seen displaying on the edge of a young conifer wood, where Redpolls and a Tree Pipit were indulging in their song flights. At the northern end of the site, Sand Martins were beating along low over the River Hull. Back at the pumping station we saw Pied Wagtail and Spotted Flycatcher. The Yellow Wagtail, probably the most typical species of the River Hull valley, was seen and heard in all parts of the area. The only bird of prey noted was the Kestrel. There was a complete absence of Wrens, which had suffered greatly during the previous hard winter. In all, fifty-two species were recorded.

Entomology (J. H. Flint)

As on so many occasions in 1979, insects were by no means plentiful on this excursion and the entomologists present had to work hard for little reward. A marshy area near the river held the most interesting community, mainly ground-beetles and rove-beetles, including *Bembidion biguttatum* F., *B. clarki* Daws., *Agonum moestum* Duft., *A. thoreyi* Dej., and the ladybird *Subcoccinella 24-punctata* L. Mr K. G. Payne worked the pond in the water complex and found the water beetle population rather sparse, the total taken being *Hygrotus versicolor* Schall., *H. inaequalis* F., *Hydroporus palustris* L., *H. planus* F., *H. pubescens* Gyll., *Laccophilus minutus* L., and *Haliplus lineatocollis* Marsh. In the wide drain running parallel to the river, at the northern end of the waterworks complex, beetles were even fewer and only two additional species were found here, *Potamonectes depressus s. elegans* Pz. and *Gyrinus aeratus* Steph. Records of the little whirligig-beetle *G. aeratus* are few and scattered and its main population was considered by Balfour-Browne to be in south and east England up to East Yorkshire so this was a notable find. The only other significant discovery was that of the hopper *Cercopis vulnerata* Illig. which does not seem to have been seen here before. This find extends its range a little further east from its original Yorkshire centre in the south of the central Yorkshire lowlands.

Lepidoptera (J. and K. G. Payne)

Although quite a range of insect species was seen, they were low in numbers. Amongst the butterflies observed were *Pieris brassicae*, *P. napi* and *P. rapae*, *Euchloe cardamines* (both

sexes), *Polyommatus icarus*, *Coenonympha pamphilus*, *Ochlodes venata*, and *Thymelicus sylvestris*. The moths seen included *Spilosoma luteum*, *Tyria jacobaecae*, *Odezia atrata*, *Lomaspilis marginata*, *Xanthorhoe montanata*, and *Apatele psi*. Small numbers of larvae of *Euproctis similis* were present on the hawthorn hedge by the garden and a few *Cerura vinula* larvae were found on low growing poplars.

Vascular Plants (D. R. Grant)

Despite the drainage ditches around the reservoirs and the marshy area between the River Hull and the Beverley and Barmston Drain, quite a few common aquatic plants were absent. However, large colonies of plants grew where there was running water. The southern area had *Ranunculus lingua* and *Rumex hydrolapathum*, together with large beds of *Carex riparia* and *Glyceria maxima*. In damp grassy areas, the orchids *Dactylorchis fuchsii* and *D. incarnata* were found, together with some excellent examples of first cross-hybridization.

Nearby were *Thalictrum flavum* and *Cardamine amara*. The bottom of a small ditch around the circular reservoir was completely filled by the pondweed *Groenlandia densa*. The Beverley and Barmston Drain had some fine colonies of the pondweeds *Potamogeton lucens*, *P. crispus* and *P. pectinatus*. In dried grassy places around the circular reservoir were large colonies of *Carex hirta*, *C. flacca*, *C. lepidocarpa*, and *Festuca arundinacea*. Both water plantains, *Alisma plantago-aquatica* and *A. lanceolatum*, were present in a small pond near the pumping station. After lunch the area around the water intake screens was examined. The drains yielded *Hippuris vulgaris*, *Elodea canadensis*, *Ranunculus aquatilis*, and *Berula erecta*. *Oenanthe fluviatilis*, the rarest plant discovered, was found here by the River Hull, and *Scirpus lacustris* and *Stachys palustris* were growing along the river bank. In a drier grassy area near the large reservoir were the sedges *Carex disticha*, *C. spicata* and *C. ovalis*.

Bryophytes (T. L. Blockeel)

A rich bryophyte flora was not to be expected in a locality dominated by tall grasses and marsh vegetation. Two habitats were of interest, walls and patches of bare ground: the concrete walls of the reservoir were most notable for three species of *Orthotrichum*, *O. anomalum*, *O. cupulatum*, and extensive sheets of *O. diaphanum*. The two former are little recorded in VC 61, presumably because of the lack of suitable rock outcrops or walls. At the northern end of the site *Gyroweisia tenuis* was on a wall by the lock. Species of bare ground included *Aloina aloides* var. *aloides* in dry spots and *Bryum pseudotriquetrum* var. *bimum*. *Riccardia sinuata* and *Leiocolea turbinata* in damp or wet places. Thirty-four species were recorded in all.

Goathland (VC 62) (21–22 July) (I. C. Lawrence)

The first day of the weekend meeting was spent in the Darnholme — Beck Hole area near Goathland. The country around here is well known for its beauty. The Eller Beck flows through a deep valley from Darnholme towards Beck Hole and then on the the Murk Esk. The second day was spent in the wooded area north of Goathland and included the spectacular Mallyan Spout waterfall. Saturday was showery ending in a downpour, which wet many of us caught in the open. Sunday was drier, but remained cloudy.

Entomology (J. H. Flint)

The weather was unkind and the frequent showers spoilt collecting on Saturday, when the party visited Darnholme. Here Mr Ely found the large hoverfly *Sericomyia lappona* L., a frequent insect on the upland moorlands, and Mr K. G. Payne took the bug *Chartoscirta cocksi* Curt. on *Sphagnum* by Darnholme Beck. Mr Payne also found the weevils *Apion frumentarium* Pk. and *A. marchicum* Hbst. on *Rumex acetosella* and had the bugs *Asciodema obsoletum* Fieb. on gorse and an abundance of *Heterocordylus tibialis* Hahn from a single broom bush.

It is greatly to be regretted that the dull, cool weather and wet vegetation on Sunday kept insects inactive at Beck Hole, as those taken indicate that this place, with its flowery margins to old woodland sheltered by steeply sloping valley sides, is likely to hold a rich variety. Those taken included the longhorn beetles *Strangalia maculata* Poda, *S. quadrifasciata* L. and *Alosterna tabacicolor* Deg., the hoverfly *Pyrophaena rosarum* F. and the sawfly *Tenthredo ferruginea* Schrk.

The only other insects of note were the shield bug *Pentatoma rufipes* L., which was beaten in quantity from Rowan and Oak at Darnholme, and the black and red hopper *Cercopis vulnerata* Illig. which is here at the northern limit of its known British range.

Lepidoptera (K. G. Payne)

Although it was dull most of the time and there was a very heavy shower on the Saturday afternoon, it was surprising how few butterflies were seen in the bright periods. The only ones recorded were a few *Coenonympha pamphilus* and *Maniola jurtina* and a single *Pieris rapae*. Among the moths *Odezia atrata* was plentiful at Beck Hole, and *Idaea aversata*, *Campaea margaritata*, *Lyncometra ocellata*, *Ortholitha chenopodiata*, *Abraxas sylvata*, and a few larvae of *Eupithecia pulchellata* were also found. *Tortix viridana* was noted.

The Sunday morning visit to Fen Bog revealed good colonies of *Nymphula nymphaeata* where there was open water with Potamogeton. *Syngrapha interrogationis* and *Coenonympha tullia* were also seen there.

Vascular Plants (I. C. Lawrence)

The Darnholme valley proved to be interesting, as the slopes running down from the moor tops were very marshy and in one place there was a calcareous flush in which masses of *Pinguicula vulgaris* and *Anagallis tenella* occurred. Also found in this region was *Carex lepidocarpa*. Other sedges in the more acid parts included *Carex remota*, *C. pallescens*, *C. laevigata*, and *C. sylvatica*. *Sieglingia decumbens* was present and a plant of *Hypericum androsaemum*. Other interesting finds in this area were large quantities of *Drosera rotundifolia*, *Lychnis flos-cuculi*, *Hydrocotyle vulgaris*, *Myosotis secunda*, *Ranunculus hederaceus*, *Asplenium adiantum-nigrum*, and in the woods near Beck Hole, one plant of *Epipactis helleborine*. These woods were further investigated on the following day and a quantity of *Ophioglossum vulgatum* was found along with a nice list of plants including *Melampyrum pratense* and the sedges *Carex ovalis* and *C. spicata*. In all some 260 plants were seen, eleven of which were new for the square NZ80, which has been well recorded in the past.

Bryophytes (T. L. Blockeel)

At Darnholme, boggy ground produced a number of species, but nothing surprising. However, *Plagiothecium ruthei* was on a wet bank, *Gyroweisia tenuis* on a wall, and *Nardia compressa*, *Marsupella emarginata* and *Hygrohypnum ochraceum* on stones in streams.

Mallyan Spout and its environs were more productive. Wet rocks at the Spout were rich in hepatics, with *Preissia quadrata*, *Solenostoma pumilum*, *S. triste*, *Plectocolea obovata*, and *Mylia taylori*. Mosses included *Mnium stellare*, *Hookeria lucens* and *Eurhynchium pumilum*. Rocks on the river bank produced *Solenostoma sphaerocarpum*, *Heterocladium heteropterum* and *Tetrodontium brownianum*, the latter also occurring, with fruit, on an outcrop in an open part of the valley above the woods. It was pleasing to see some impressive amounts of *Nowellia curvifolia* on rotten wood near the Spout.

Flushed slopes higher up the valley had mostly common species, including *Sphagnum squarrosum* and *Dicranella palustris*.

In all some seventy-seven species were recorded.

Plant Galls (F. B. Stubbs)

The weekend produced the good total of forty-seven galls, twenty-one being attributable to gall-mites *(Eriophyidae)*. The lateness of the 1979 season may have accounted for the reduced numbers, or apparent absence of some familiar insect galls.

The mite gall of *Eriophyes galii* was seen on *Galium aparine*. This normally widespread example had not been noted in Yorkshire during 1977 or 1978, possibly as a result of the drought of 1976, when the host plant was one of the first to suffer. The only other report this year has been from Mr W. A. Ely, of Rotherham.

Oak apples, of the gall-wasp *Biorhiza pallida*, were seen on only one tree. Two of these were on bare lengths of stem, whereas their usual site is a leafy twig.

The most interesting find was of the 'cotton-wool' gall on oak, attributed to the gall-wasp *Andricus quercus-ramuli*; this was the fifth Yorkshire record. Such a conspicuous growth would attract attention, and it must be regarded as uncommon in view of the few reports.

Anston and Lindrick (VC 63) (30 June) (W. A. Ely)

The area visited lies on the belt of Permian magnesian limestone in the extreme south of Yorkshire. A variety of different habitats were explored during the day, including woodlands, grassland, scrub, and disused canal and limestone quarries.

Anston Stones Wood (a SSSI) is the largest wood in the area and lies in the gorge cut by the Anston Brook. At the bottom the flagstones of the Coal Measures are exposed, while the cliffs and slopes are limestone. Lime and elm are the principal trees and the wood is in a fairly natural state. The northern boundary of the wood contains herb-rich grassland with limestone outcrops which support a winter annual community.

Other woodlands include Moses Seat, a damp, north-facing wood running along the cliffs on the southern border of Lindrick Common and the (broad leaved) woods operated by the Forestry Commission on the south of the Chesterfield Canal.

Lindrick Common, which is now a golf course, contains many areas of scrub and grassland with interesting communities.

The Chesterfield Canal was built over two centuries ago but became disused when the summit tunnel collapsed early this century. It has since reverted to a rich wildlife habitat, as have the numerous quarries. Lindrick Dale, Brancliffe and the Lindrick Common quarries all contain interesting plants and animals.

Entomology (J. H. Flint)

The day was blessed with some warm sunshine after a dull start and insects moved freely, although they were not particularly numerous. The quarries in Lindrick Dale had good populations of mainly common insects and here Mr W. A. Ely had several glowworms, *Lampyris noctiluca* L., a very local beetle in Yorkshire, although the records are widely scattered. The quarries also had considerable populations of the very local little bug *Hoplomachus thunbergi* Fall. on Mouse-ear Hawkweed.

The most prolific area, and the most interesting, was the northern edge of the railway cutting through Anston Stones Wood and the adjacent open grassland and woodland margin. Nymphs of *Meconema thalassinum* DeG. were found here on Oak and this bush cricket is at about the northern limit if its general range here in South Yorkshire, although isolated colonies have been found as far north as Hackfall Wood (in 1882). Other insects taken here included the beetles *Dascillus cervinus* L., *Isomera murina* L., *Chrysolina varians* Schall. (larvae commonly on *Hypericum*), *Miarus campanulae* L. (on *Campanula*), *Gymnetron antirrhini* Payk. (on *Linaria*), and the sawflies *Tenthredopsis coquebertii* Klug and *Tenthredo moniliata* Klug.

A visit to the canal proved almost entirely unrewarding in the brisk breeze, although examples of the wasp-like sawfly *Tenthredo scrophulariae* L. were found here on *Scrophularia aquatica.*

Lepidoptera (J. and K. G. Payne)

Eight species of butterflies were seen: *Pieris brassicae*, *napi* and *rapae*, *Aglais urticae* (larvae, much parasitized), *Maniola jurtina*, *Ochlodes venata*, *Polyommatus icarus*, and *Coenonympha pamphilus.* The last named was plentiful and two observers reported seeing a white specimen. Among the moths *Odezia atrata* was plentiful in a meadow and larvae of *Zygaena trifolii* and *filipendulae* were taken there. *Epirrhoe alternata*, *Xanthorhoe montanata*, *Camptogramma bilineata*, *Lomaspilis marginata*, *Opisthograptis luteolata*, *Phlogophora meticulosa*, *Autographa pulchrina*, *Drepana falcataria*, *Lomographa temerata*, *Cucullia verbasci* (larvae on figwort and mullein), *Euproctis simileis* (pupae under a shelter) were also recorded. Amongst the smaller moths *Anthophila fabriciana* was noted on Dog Daisy flowers and *Adela fibulella*, *Ebulea crocalis*, *Opsibotys fuscalis*, and *Udea lutealis* were also taken (latter species in larval state). The work of *Yponomeuta cagnagella* was conspicuous on Spindle, on hedgerow bush being completely defoliated.

Arachnology (J. C. Smith)

A small area of Anston Stones Wood between SK536 828 and SK532 832 was investigated. The following species were recorded: *Clubiona terrestris*, *Theridion ovatum*, *Maso sundevalli*, *Pardosa lugubris*, *Araneus opistographus*, *Lepthyphantes tenuis*, *L. hortensis*, *Gongylidium rufipes*, *Monocephalus fuscipes*.

Investigation at Lindrick Dale Quarry (SK540 822) was entirely limited to species found under stones. *Amaurobius fenestralis*, *Coelotes atropos*, *Phrurolithus festivus*, *Euophrys frontalis*, *Cicurina cicur*, *Lepthyphantes tenuis*.

The northern bank of the Chesterfield Canal (between towpath and canal) was investigated between SK535 815 and SK538 815. The following species were recorded: *Clubiona stagnatilis*, *C. lutescens*, *Trochosa terricola*, *Pirata piraticus*, *Dismodicus bifrons*, *Tetragnatha extensa*, *Lophomma punctatus*, *Nesticus cellulans*, *Lepthyphantes tenuis*.

Limitations of time and the dry conditions prevented any comprehensive work, particularly in the *Linyphiidae*. Three species call for comment:

1. *Cicurina cicur*. A single female was taken in the Quarry. Falconer did not record this species in Yorkshire. One Yorkshire record exists, recorded by Dixon in *The Naturalist* but with no data. More recently Adrian Norris has taken it in Brantinghamdale and Drewton Dale, near Hull. This seems to be its third Yorkshire record, and possibly its first in VC 63.
2. *Nesticus cellulans*. Two females with egg capsules were taken by the canal side. No published records seem to exist for its occurrence south-east of a line drawn from Scarborough through Wakefield, but Falconer found it frequently in the western half of VC 63.
3. *Phrurolithus festivus*. Recorded once by Falconer (1907 at Wilsden VC 63) and subsequently on a handful of occasions. Two females were taken from under stones in the Quarry.

Flowering Plants (D. R. Grant)

Anston Stones Wood is the 'locus classicus' for *Tilia cordata* and *Hordelymus europaeus*. The grassy area above the wood had the following species: *Gymnadenia conopsea*, *Ophrys insectifera* and *Listera ovata*. In the open woodland the shrubs *Euonymus europaeus*, *Rhamnus catharticus*, *Ligustrum vulgare*, and *Thelycrania sanguinea*. Some interesting grasses here were *Melica nutans*, *Poa compressa* and *P. nemoralis*. In the shady parts of the wood were some fine specimens of *Phyllitis scolopendrium* and *Polystichum aculeatum*. At the head of the valley there was a fine colony of *Vicia sylvatica* in full flower.

The short turf on Lindrick Common is the home of *Cirsium acaulon*. This seems to be increasing very slowly, as it is now to be found here in three separate 1 km grid squares. On ground recently cleared, *Hypericum montanum* and *Helianthemum chamaecistus* were recolonizing bare patches. *Spiranthes spiralis* is also known from this area. In Lindrick Dale quarry there was a fine show of *Dactylorchis fuchsii*. In the short turf *Ophrys apifera*, *Blackstonia perfoliata*, *Gentianella amarella*, and *Clinopodium vulgare* were growing. On the dry quarry floor were the following grasses: *Catapodium rigidum* and *Aira caryophyllea*. Here also was *Plantago coronopus*. Nearby in a railway cutting, there were a few plants of *Onobrychis viciifolia*.

In the old quarries and marshy areas around Shireoaks the following plants were seen: *Atropa belladonna*, *Asplenium adiantum-nigrum*, *Hippuris vulgaris*, *Scipus lacustris*, *Carex paniculata*, and *Equisetum telmateia*.

Species not recorded on this excursion but which are known from the area are *Dipscacus pilosus*, *Sorbus torminalis* and *Pyrus communis*.

Bryophytes (T. L. Blockeel)

This area is one of the most important bryophyte localities in VC 63 and the opportunity is taken here to mention, in addition to species seen during the meeting, some additional ones recorded during 1978.

At Anston Stones Wood the bryoflora of a wooded magnesian limestone valley is seen to best advantage. The availability of cliff and boulder habitats in a humid environment gives rise to

a collection of species unrivalled elsewhere on the Yorkshire Permian. The list includes: *Metzgeria pubescens*, *Scapania aspera*, *Porella platyphylla*, *Cololejeunea rossettiana*, *Marchesinia mackaii*, *Distichium capillaceum*, *Fissidens cristatus*, *Tortula marginata*, *Gymnostomum calcareum*, *Eucladium verticillatum*, *Trichostomum brachydontium*, *Tortella tortuosa*, *Mnium stellare*, *Plagiomnium cuspidatum*, *Zygodon viridissimus* var. *stirtonii*, *Neckera crispa*, *Anomodon viticulosus*, *Amblystegium compactum*, *Platydictya jungermannioides*, *Cirriphyllum crassinervium*, *Eurhynchium pumilum*, and *Rhynchostegiella tenella*. An unshaded part of the railway cutting has *Trichostomum crispulum*, *Campylium calcareum* and two tiny winter annuals, *Pottia recta* and *Phascus curvicolle.*

The old quarry at Brancliffe, examined during the meeting, has some interesting xerophytic species, including *Pottia lanceolata*, *Alonia aloides* var *aloides*, *Barbula hornschuchiana*, *Weissia microstoma*, and *Encalypta vulgaris*. These are all on rock ledges or spoil heaps. Other parts of the quarry floor are wet and support *Fissidens adianthoides*, *Bryum pseudotriquetrum* and *Cratoneuron commutatum*.

From wet ground near Shireoaks there was little to report except *Gyroweisia tenuis* on a stone, the abundant rhizoidal gemmae distinguishing it from the otherwise similar *Gymnostomum calcareum* which had already been seen at Anston Stones.

Threats and Pressures (W. A. Ely)

Many potential threats affect this area. Anston Brook, which traverses much of the area visited, is polluted by three sewage works above Anston Stones Wood. The Chesterfield Canal supplies water to industrial users in Worksop and the dredging activities which are used are detrimental to wildlife. The national demand for limestone is a threat and a new quarry was opened nearby a few years ago. The whole area we visited is included in a proposed linear park, which would obviously be developed to benefit the majority of its intended users, rather than to preserve its natural beauty. Fortunately the recently formed Anston Conservation Society is working to safeguard this beauty and the rich diversity of the flora and fauna present.

Kirkby Malzeard (VC 64) (7 July) (J. Roberts)

Over forty members were present on a day which started damp and overcast but turned out fine and clear. The morning was spent exploring the steep valley of Dallowgill, west of the village. Semi-natural oakwood, coniferous plantations of various ages, a clear stream and open moorland provided a good variety of acidic habitats.

The party moved south to Skell Gill for a picnic lunch, and the afternoon walk proceeded up the River Skell, through marshy fields, to the duck-ponds under the eaves of the oakwood in upper Skell Gill. Some members penetrated the wood itself and the moorland opposite, with its many acidic flushes and streams.

Mr G. A. Shaw chaired the meeting at Dallowgill; sixteen societies were represented at the rollcall, and sectional reports on the day's activities were presented. Mr J. R. Hickson gave the vote of thanks to the various landowners who had given us access; to Mr and Mrs Peacock for the catering and meeting-room; and to the divisional secretary.

Entomology (J. H. Flint)

The short stretch of Dallowgill that was visited in the morning by the entomologists (mainly the open track through conifer plantations), held little of special note to interest them and insects were rather sparse. *Bombus monticola* Smith (*lapponicus* auctt. Brit.), the typical bumble-bee of the uplands and always rather local there, was a welcome sight. The most interesting feature was the population of mound-building wood ants, *Formica rufa* L. This is the common wood ant of the south, generally replaced in the north and in Yorkshire by *Formica lugubris* Zett., which is particularly abundant in parts of the moorlands of north-eastern Yorkshire. Colonies of wood ants are very restricted in the western half of the county.

In the Skell valley insects were more numerous although the wind adversely affected collecting and, as in Dallowgill, most of the insects seen were common ones. The few of note were the handsome weevil *Attelabus nitens* Scop. which was found, with many of its curious

typical leaf-rolls on the oak, by Mrs H. E. Flint, and the muscid flied *Coenosia intermedia* Fall. and *Fannia vesparia* Meade which were taken by Mr W. A. Ely who also had the sawfly *Pachynematus obductus* Hart. here as well as in Dallowgill.

Lepidoptera (Mrs J. Payne)

At Dallowgill *Pieris brassicae*, *P. napi*, *Euchloe cardamines*, and *Polyommatus icarus* were flying and a large colony of *Aglais urticae* larvae was found on nettles in a lane. A small colony of *Odezia atrata* was present in a forest ride and *Ematurga atomaria* and *Epirrhoe tristata* were also noted. Skell Gill was a little richer and five additional butterflies were recorded: *Pieris rapae*, *Maniola jurtina*, *Coenonympha pamphilus*, *Lycaena phlaeas*, and *Ochlodes venata. Odezia* was seen here too, and a *Procus* species was collected from flowers of Goutweed.

Vascular Plants (F. J. Roberts)

The plantation and oakwoods provided few unusual plants; of more interest were the banks, track- and stream-sides, and the many marshes and boggy, flushed spring-zones. The track down from the meeting place into Dallowgill had an abundance of *Mimulus moschatus* in full flower in the adjacent ditch, and nearby two 'heterophyllous-leaved' Water Crowfoots — *Ranunculus hederaceus* and *R. omiophyllus* — grew together. A bush of *Prunus padus* was growing by the stream, and other plants of damp spots nearby were *Equisetum sylvaticum* and three characteristic sedges, *Carex remota*, *C. laevigata* and *C. pallescens. Corydalis claviculata* grew in abundance in a recently replanted area. The several marshes on the valley sides above Skell Gill proved to be very varied. Both *Dactylorhiza maculata* and *D. fuchsii* were noted, and other typical plants included *Achillea ptarmica*, *Viola palustris* and *Hypericum tetrapterum.* My own list includes seven species of rushes and twelve sedges. One small spring, shaded by oak and ash, had a fine colony of *Carex paniculata* with the previously noted *Carex remota* and *C. laevigata. Crepis paludosa* was also common here. On dry, sandy soils above the valley were *Carex pilulifera* and the scarce *Hypericum humifusum.*

The newly-constructed duck-ponds had large sheets of *Potamogeton natans* and on the muddy margin of one grew *Peplis portula* and *Gnaphalium uliginosum.* The oakwood itself, at the head of Skell Gill, seemed quite unspoilt; much of the ground flora was dominated by bryophytes and few vascular plants were noted. Across the stream were some interesting springs with sheets of *Montia fontana* and *Chrysosplenium oppositifolium*, with *Drosera rotundifolia*, *Anagallis tenella*, *Myosotis brevifolia,* and *Carex pulicaris* nearby. At the edge of a large *Sphagnum* and *Juncus effusus* bog was a small patch of fruiting *Trientalis europaea.*

Bryophytes (T. L. Blockeel)

The area of oak woodland examined in Dallowgill was unexceptional. *Dicranum tauricum* was present, but this was no great surprise since the area seems to be the 'headquarters' in Yorkshire of this local species. The stream was more interesting, especially for some fine beds of *Atrichum crispum, but also for Nardia compressa* and *Solenostoma sphaerocarpum* on stones in or by the water. *Dicranella rufescens* was on the stream bank and *D. schreberana* on disturbed ground nearby.

Skell Gill Wood had many of the species of Dallowgill, including *Dicranum tauricum* and *Atrichum crispum*, but the woodland flora was better developed. There were some very fine mounds of *Leucobryum glaucum*, and boulders had *Barbilophozia attenuata*, *Scapania umbrosa*, *Dicranum fuscescens*, and *Dicranodontium denudatum.* The flora in general was limited by the absence of any irrigated rock outcrops in the area investigated.

In all sixty-eight species were recorded.

Dent (VC 65) (19–20 May) (F. B. Stubbs)

Some 25 members attended the Field Meeting, and eleven societies were represented. The weather was fine but cool, and the long, severe winter had delayed the appearance of most flowers and insects. The two mornings were spent west of the Dent Fault, at Helmside Gill and Combe Scar respectively. Here, acid conditions predominated, although calcareous flushes make Combe Scar a richly varied locality. The afternoon routes included the banks of the River Dee near Whernside Manor, and Flinter Gill. The district has been virtually

untouched by any of the current recording schemes, and several useful lists were compiled. The Saturday afternoon ended very pleasantly when Mr and Mrs C. H. Wilson invited the members to join them at tea.

After an enjoyable meal at Dent, Dr L. Lloyd-Evans took the chair when reports were presented. The meeting resolved that Combe Scar be referred to the Nature Conservancy Council as a potential SSSI; at the time of writing, the response has been encouraging. Mr T. Blockeel expressed the thanks of the members to Mr and Mrs Wilson for their hospitality, to Mr Wilson and Mr Stoddard for their advice, based on local knowledge, and to the divisional secretary and Mrs Stubbs.

Entomology (J. and K. G. Payne)

The early date of the meeting, after such a long and hard winter, perhaps accounted for the scarcity of Lepidoptera. The only butterflies seen were *Pieris brassicae* and *napi*, and *Aglais urticae*, the latter flying around nettles by the wall beside the road where we left for Combe Scar. Webs and empty chrysalids of *Yponomeuta evonymella* were seen on Bird Cherry. Mrs Lloyd-Evans collected the ground beetles *Nebria rufescens* (by the River Dee at Whernside Manor), and *Loricera pilicornis*, *Pterostichus strenuus* and *madidus* at Helmside Gill. In the last named locality the uncommon hoverfly *Cheilosia albipila* was swept from Dogs Mercury and *Dianous coerulescens* was taken from moss by the waterfall. At Combe Scar *Coccinella 7-punctata* was frequent, and a single *Geotrupes stercorosus* was seen by Mr J. H. Flint. Pools at about 580 m on the ridge west of Barbondale were sampled for water beetles but only *Hydroporus pubescens* and *Agabus bipustulatus* were found.

Vascular Plants (F. B. Stubbs)

In spite of the lateness of the season, the recording by Mrs J. E. Duncan on the Saturday, and by Mr W. J. Stone on the Sunday, resulted in quite an extensive list of species. *Lathraea squamaria* was prominent in several stations, with *Adoxa moschatellina* and *Ranunculus auricomus* also in and near woodlands. The most areas yielded *Pinguicula vulgaris*, *Primula farinosa*, *Carex caryophyllea*, and *Viola palustris*; *Saxifraga tridactylites* and *S. hypnoides* were seen on drier ground. The only orchids positively identified were *Listera ovata* and, in Coombe Scar, *L. cordata*. Coombe Scar also contributed to the fine tally of ferns, with *Hymenophyllum wilsonii*, *Cryptogramma crispa*, *Asplenium viride*, *Thelypteris dryopteris*, and *T. phegopteris*.

Bryophytes (T. L. Blockeel)

The rich bryophyte flora of Dentdale is evidenced by the list of 161 species which were identified from the excursions, and this is in no way an exhaustive list. Three areas were examined, Helmside Gill and environs, the banks of the River Dee, and the impressive slate crags of Coombe Scar.

(1) Helmside Gill:

The damp rock faces of this dramatic wooded gully produced a distinctly basicolous flora. Among species noted were *Amblystegium fluviatile*, *Cirriphyllum crassinervium*, *Mnium stellare*, *Neckera crispa*, *Rhynchostegiella teesdalei*, *Seligeria recurvata*, and *Lejeunea cavifolia*. In the upper part of the gully, a tuft of *Zygodon viridissimus* was collected and later found to have interwoven among it *Cololejeunea calcarea* and *Lejeunea lamacerina*, the latter new to VC 65. Where the rock was covered with humus, away from the stream banks, the vegetation was more calcifuge with quantities of *Dicranum majus* and *Leucobryum glaucum*, with some *Barbilophozia attenuata*. One notable feature of the gill was the abundance of *Nowellia curvifolia* on logs, very fine and fruiting. The epiphyte flora of Dentdale has evidently survived better than in most of Yorkshire, as was only to be expected. *Lejeunea ulicina* was on many trees in the gill, where *Frullania dilatata* and *Hypnum mammillatum* were also seen. Additions from trees on more open ground below the gill were *Orthotrichum affine*, *O. diaphanum*, *O. lyellii*, and *O. striatum* with a small amount of immature *Ulota crispa* probably var. *norvegica*. The *O. striatum* is particularly interesting. The most recent record which I can trace from any of the Yorkshire vice-counties is that of Tadcaster (VC 64) in 1898.

(2) Banks of the Dee:

Limestone rocks by the riverside in the Whernside Manor area produced *Distichium capillaceum*, *Lejeunea cavifolia* and *Cololejeunea calcarea*. *Schistidium alpicola* var. *rivulare* was on boulders in the river. On tree roots on the river banks below Gawthrop were *Leskea polycarpa*, *Anomodon viticulosus* and a very small amount of *Orthotrichum sprucei*. Mention may also be made here of *Bryum ruderale* on a path at Whernside Manor and fruiting *Barbula revoluta* and *Frullania tamarisci* on walls nearby.

(3) Coombe Scar:

The slate crags, reminiscent of the better-known Cautley Spout area, proved a most interesting hunting-ground. The presence of *Andreaea* species indicated that the rock was acidic, but there were others such as *Pohlia cruda* which suggested that it was at least locally base-enriched. Coombe Scar is an old locality for a very scarce and handsome moss, *Bartramia hallerana*, and this was duly refound on the high crags. *Plagiobryum zieri* was found with capsules in a damp gully. Other species on an among the rocks were *Amphidium mougeotii*, *Bartramia pomiformis*, *Blindia acuta*, *Campylopus atrovirens*, *Gymnostomum aeruginosum*, *Heterocladium heteropterum*, *Isopterygium pulchellum*, *Oxystergus tenuirostris*, *Rhytidiadelphus loreus*, *Seligeria recurvata*, *Sphagnum quinquefarium*, *Bazzania trilobata*, *Frullania tamarisci*, *Lophozia incisa*, *Mylia taylori*, *Preissia quadrata*, and *Ptilidium ciliare*. The best find here, however, and the best find of the meeting was *Bazzania tricenata*, an oceanic hepatic here in its only known Yorkshire station, although formerly it was also recorded in 1857 by Carington on Whernside and a few stems from Ingleborough.

The flushed hillsides below the crags were also of interest. Records here included *Breutelia chrysocoma*, *Campylopus fragilis*, *Scorpidium scorpioides*, *Sphagnum warnstorfii*, *Thuidium delicatulum*, and in runnels *Solenostoma cordifolium*.

BOOK REVIEWS

Lichen Flora of Lincolnshire by **M. R. D. Seaward**. Lincolnshire Natural History Brochure No 8. Pp 18. Lincolnshire Naturalists' Union. 1980. £1.65 (post free, from Mrs V. Pennell, Waddington House, Malt Kiln Lane, Waddington, Lincoln)

Lincolnshire is the second largest British county, but its lichen flora is not extensive owing to the very small area (less than 3 per cent) supporting woodland and the intensively farmed state of most of the rest. Dr Seaward has studied the available records very thoroughly as well as carrying out much field work over most of the county, and his annotated checklist includes more than two hundred species. He also mentions another twenty or so species which were either recorded erroneously or are now extinct. This is a useful little brochure, but unfortunately in the interests of economy a truly Spartan method of printing has been used, which makes a technical publication of this kind unnecessarily difficult to read and introduces minor ambiguities in places.

FHB

Animals and Their World by **Mary Parker Buckles**. Pp 240, including numerous text illustrations. Blandford. 1979. £8.95

Following a short introduction on biology, classification and zoogeography, the author then goes on to provide brief accounts of the biology of a selection of mammals from each of the major vegetation types. The emphasis is thus on the biome and what lives in it. There are numerous drawings and black and white and colour photographs many of very high quality. The selections are good in that they include mammals from several different orders. As a broad introduction the account is most useful. The texts on the species have no similarity of pattern and really amount to a few casual jottings which in some instances are rather naïve. Under no circumstances could one consider the sahelian savanna a temperate grassland as the author suggests.

MJD

Animal Life of the Galapagos by **Norman Hickin**. Pp 236; illustrated in black and white. Ferendune Books. 1979. £6.65

Nowadays the remotest places are within the reach of holidaymakers, and this book about the animals of the Galapagos Islands includes a twenty-page section of advice to tourists! The rest of the book gives short descriptions aimed at aiding identification of mammals, birds, reptiles, inshore fishes and a selection of insects and other invertebrates. All of these, except the land mammals which are of course introduced species, are illustrated by the author in a very black and white and rather flat style, which no doubt is what is required as an uncritical aid to recognition.

FHB

The Flora of Aldabra and Neighbouring Islands by **F. R. Fosberg** and **S. A. Renvoize**, with illustrations by **Mary Grierson** and **Ann Davies**. Pp vi + 358, including 2 maps and 55 figures. Kew Bulletin.

Additional Series VII/HMSO. 1980. £15, limp covers. Authoritative account of the plants of a group of small Indian Ocean islands.

Endogenous Plant Growth Substances by **Thomas A. Hill**. Pp iv + 68.
Studies in Biology No 40/Edward Arnold, 2nd edition. 1980. £2.40, paperback.

Memoir of the Life and Works of Edward Newman by His Son (**Thomas Prichard Newman**). Pp 36, illustrated. Classica Entomologica No 6, E. W. Classey, Faringdon. 1980. £2, paperback. Facsimile of the 1876 biography with a new introduction by E. W. Classey.

Konrad Lorenz by **Alec Nisbett**. Pp xiv + 240, plus 16 pages of b/w plates. Dent 1980. £3.50. Paperback issue of the biography of the 'father of modern ethology' first published in 1976.

Garden in the Hills by **Elizabeth West**. Pp 205, plus 4 pages of b/w plates. Faber & Faber. 1980. £5.95. Creation of a garden on a windswept Welsh moorland — sequel to *Hovel in the Hills*.

Planting Native Trees and Shrubs by **Kenneth Beckett** and **Gillian Beckett**. Pp 64, with full colour illustrations. Jarrold Colour Publications, Norwich. 1979. £1.99, paperback. What, where and how to plant, as well as morphological and ecological information, are provided for native species.

The Flora of Wiltshire by **D. Grose**. Pp viii + 213 (large format, 4 pages photo-reduced/page), including maps and b/w plates. EP Publishing, Wakefield. 1979. £17.50. Reprint of 1957 edition with further introductory matter provided by R. E. Sandell and others; one of the best modern floras, particularly for its habitat studies and detailed biographical and bibliographical sections. Despite reduction, the type is very clear, but the photographic plates are less successful in facsimile.

The Harvest Mouse by **Stephen Harris**, **The Common Dormouse** by **Elaine Hurrell**, **The Red Deer** by **Brian Staines**, **The Wild Rabbit** by **David Cowan**, **The Red Squirrel** by **Andrew Tittensor**, and **The Greater Horseshoe Bat** by **Roger Ransome**. 1980. Blandford Press. Each £2.95

Six attractively produced books published in association with The Mammal Society; although each is only 43 pages long, they are copiously illustrated (mainly full colour plates) and packed with information for the junior naturalist.

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Edited by M. R. D. SEAWARD, MSc, PhD, FLS, The University, Bradford

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967-1970) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price 50p plus 15p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

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The Yorkshire Naturalists' Union maintains a list of speakers willing to lecture on a variety of natural history subjects. Secretaries of Affiliated Societies and similar bodies should apply to the Administrative Office, Mr D. Bramley, c/o Doncaster Museum, Chequer Road, Doncaster DN1 2AE for further details of this service.

A REQUEST

It is proposed to start an album of photographs of interest to the Y.N.U. We would be very glad to receive prints of people or events either as a gift or on loan for copying, with dates and as much information as possible. We hope the collection will stretch from the early years of the Union to the present day and become part of the Y.N.U. Archives.

Please send to Mrs J. E. Duncan, 23 Rupert Road, Ilkley LS29 0AQ.

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Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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A NEW SPECIES OF *GYMNOPHORA* MACQUART (DIPTERA, PHORIDAE) FROM YORKSHIRE AND DURHAM

R. H. L. DISNEY

Malham Tarn Field Centre, Settle, North Yorkshire

Two species of the distinctive scuttle fly genus *Gymnophora* Macquart have been recognized as occurring in Britain, namely *G. arcuata* (Meigen) and *G. quartomollis* Schmitz. The author possessed specimens that keyed out to these two species when he was sent a series collected in Scotland by Dr A. G. Irwin. These keyed out to *G. quartomollis* Schmitz in the keys of Schmitz (1920), Lundbeck (1922) and Delage and Lauraire (1973). However, the males had genitalia obviously different from specimens from Yorkshire that equally convincingly keyed out to *G. quartomollis.* Two palaearctic species not covered by the above keys are *G. lapidicola* (Bezzi, 1922) (Ghidini, 1934) and *G. verrucata* Schmitz (1927), but neither can be confused with *G. quartomollis*. On examining the specimens standing under *G. quartomollis* in the British Museum (Natural History) it quickly became apparent that both species were present.

The published descriptions of *G. quartomollis* appear to embrace both the species that key to this species. The question was 'which of the two species was the true *G. quartomollis?*' Schmitz (1920) did not designate a holotype and his description suggests his type series embraced both species. He listed his specimens examined thus 'Valkenburg 29.6.1919 1♀ (Coll de Meijere); Limbricht 4.6.1917 1♂ and 10.6.1919 1♂; Watersleijde 13.6.1917 1♀. Nur das Exemplar in Coll der Meijere hat normale Grösse, die übrigen sind Klein'.

Through the kindness of Dr Theowald van Leeuwen (Zoölogisch Museum, Amsterdam) I have been able to examine the specimen from Valkenburg and have designated it the lectotype of *G. quartomollis* Schmitz. This leads to the recognition of the specimens collected by Dr Irwin as belonging to the same species, whereas the specimens from Yorkshire are transferred to a new species, described below. Notes on *G. quartomollis* are also provided in order to clarify the differences between the two species. A Key to the three British species of *Gymnophora* is then provided.

Gymnophora healeyae n.sp. (Figs 1–6)

TYPE LOCALITY

England: Bear Park, Durham.

TYPE MATERIAL

ETYMOLOGY: The species is named for the Malham Tarn Field Centre secretary, Muriel Disney. Paratypes: 3♀, 3♂, Rowantree Scar, Yorkshire (Grid ref 44/032932) 23 September 1976; and 1♀ Waskerley Beck (Grid ref 45/015477) 30 July 1976. Leg J. C. Coulson, in coll Disney. 1♀ Salt Lake Quarry, Yorkshire (Grid ref 34/773784), 1 July 1977, R. H. L. Disney, in coll Disney.

ETYMOLOGY: The species is named for the Malham Tarn Field Centre secretary, Muriel Healey, to mark her retirement at the end of 1979.

DESCRIPTION

MALE HEAD: Frons brown, darker dorsally. Four bristles on vertex and a pair of medio-laterals in front of postero-laterals. These ML bristles measure 0.08 mm in length (range 0.06–0.1 mm) and the PLs 0.12 mm (range 0.10–0.14 mm). Antennae with dark brown, subglobular, third segment. Arista yellow-brown and pubescent. Palps yellowish to brownish distally and paler basally; they appear darker distally because of the dense hair. 3–4 conspicuous bristles near tip and several shorter bristles along most of length below. The longest bristle (near tip) measures 0.07–0.08 mm. Eyes microscopically hairy.

THORAX: Brown with a central black band and a similar band either side that only extends forwards as far as the posterior edge of the humeral callus. The oblique ridge of the

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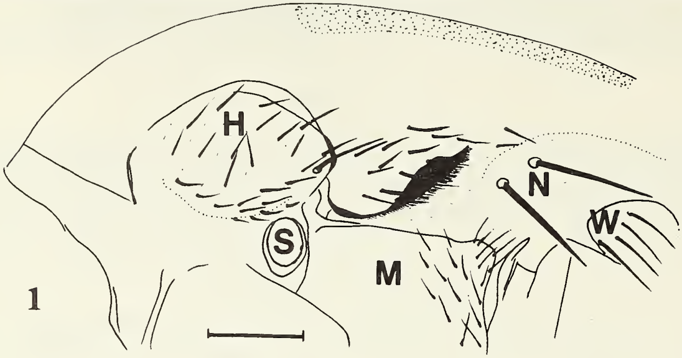

FIGURE 1
Gymnophora healeyae n.sp. part of thorax in side view to show humeral and notopleural regions.
H = humeral callus, N = notopleural bristles,
S = prothoracic spiracle, M = mesopleuron,
W = base of wing (scale line = 0.1 mm).

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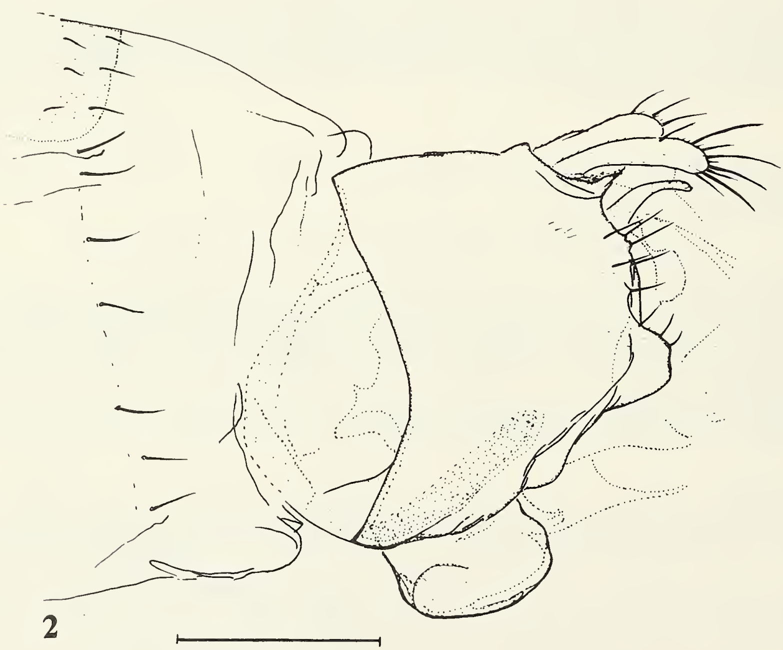

FIGURE 2
Gymnophora healeyae n.sp. Hypopygium of male viewed from left side (scale line = 0.2 mm).

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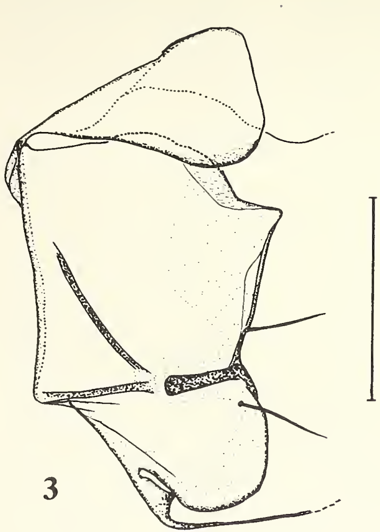

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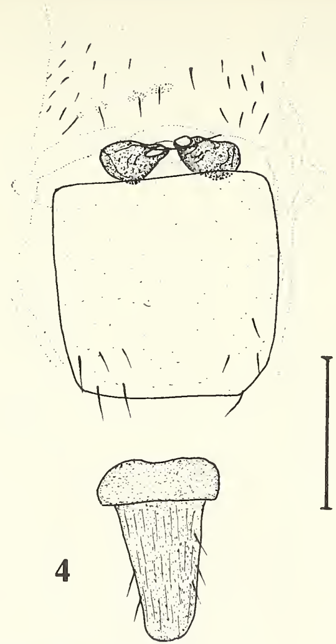

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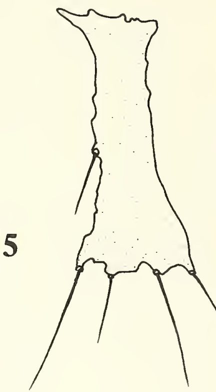

FIGURE 3
Gymnophora healeyae n.sp. ventral plate of male hypopygium (scale line = 0.2 mm).

FIGURE 4
Gymnophora healeyae n.sp. part of segments 5, and tergites 6 and 7 of female abdomen (scale line = 0.3 mm).

FIGURE 5
Gymnophora healeyae n.sp. tergite 8 of female abdomen (scale line = 0.1 mm).

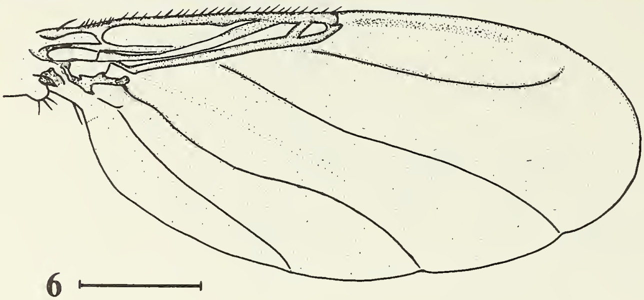

FIGURE 6
Gymnophora healeyae n.sp. right wing of female (scale line = 0.5 mm).

notopleuron (situated between the humeral callus and the notopleural bristles, and bearing along its posterior edge a dense row of fine pale hairs) is conspicuously blackened (Fig 1). Scutellum with 4 bristles almost equally developed and measuring 0.10–0.11 mm in length. Mesopleuron with a patch of short fine hairs in the posterior, upper corner (Fig 1) numbering 11–22 (mean 15). Pleurae almost black adjacent to middle and hind coxae.

ABDOMEN: With all six tergites well developed and brown in colour. The first tergite is a little shorter than the second, 2–5 are subequal, 6 is almost 3 × length of 1. Hairs sparse and fine and only readily discerned near posterior borders. Venter greyish with a few hairs on segment 6 only. Epandrium of hypopygium (Fig 2) with relatively long cerci and left side with a rounded, posteriorly directed, process posteroventrally. A patch of hairs extend from the dorsal side of this process almost to ventral edge of anal tube complex. Right side with a similar process, but bearing many more hairs. The ventral plate is short and with two simple lobes (rounded on the right side but coming to a blunt point on the left) each bearing a posteriorly directed hair situated distally towards the median line (Fig 3). The left side bears a complex, curved lateral plate arising from the junction of the ventral plate and the lower edge of the epandrium (Figs 2 and 3).

LEGS: Yellowish brown and with the slender middle and hind femora characteristic of the genus.

WINGS: Length 1.96–2.18 mm (mean 2.10 mm). Costal Index 0.45–0.47 (mean 0.46). Mean of costal ratios (+ ranges) 5.31 (4.94–6.14): 1.41 (1.22–1.50) : 1. Costa with slight swelling just before tip of vein 1. Base of vein 3 without a hair. Only 1 hair on axillary ridge. Veins brown, but middle of vein 1 somewhat pale. Vein Sc clearly developed. End of vein 4 curves towards anterior wing margin, but fades to nothing some distance from the latter. whole membrane somewhat brownish, particularly adjacent to veins. Haltere with pale yellow, almost whitish, knob and yellowish stem.

FEMALE HEAD and THORAX: Similar to male.

ABDOMEN: Tergites pale brown and present as follows: short but broad tergite (with darker posterior border) or segment 1; segment 2 with a narrower but longer tergite that narrows markedly to posterior border; segment 3 with a small tergite that does not reach posterior border of segment; segments 4 and 5 without tergites; but with scattered hairs, some of which arise from slightly chitinized patches. Segment 6 with a distinct, almost square, tergite (Fig 4). Internally between segments 5 and 6 are situated two dark-walled sacs (Fig 4). Segment 7 with a distinct brown tergite (Fig 4) and segment 8 also with an irregular, brown tergite bearing some hairs on its posterior margin (Fig 5). Segments 7 and 8, however, are frequently withdrawn. Venter brownish-grey, with a few short hairs on segment 6 and conspicuous hairs on 7 and 8.

LEGS: As male.

WINGS (Fig 6): Length 2.35–2.54 mm (mean 2.44 mm). Costal Index 0.47–0.49 (mean 0.48). Mean of costal ratios (+ ranges) 6.20 (4.41–7.43) : 1.34 (0.91–1.71) : 1. Otherwise details as male, except one specimen has two hairs on axillary ridge. Halteres as male.

Gymnophora quartomollis Schmitz, 1920 (Figs 7 and 8)
This species principally differs from *G. healeyae* as follows:

MALE HEAD: Medio-laterals not differentiated from hairs on frons in most specimens. In about a third of those examined, however, they are variously developed, but in the most strongly developed case they are still not quite half the length of the postero-laterals.

ABDOMEN: The venter of segment 6 is much more densely haired (Fig 7) than in *G. healeyae* (Fig 2). The hypopygium is distinctly different (Figs 7 and 2) in general shape. It lacks the postero-ventral processes of the epandrium found in *G. healeyae* and the cerci are much shorter. The ventral plate is short with two lobes with straight posterior edges, and the lateral plate of the left side (Fig 7) is a simpler scoop-shape with a darkened posterior border. The penis complex is apparently extruded all the time, and even when the rest of the hypopygium is withdrawn into the end of the abdomen, it remains protruding. It can even be recognized as such in pinned specimens.

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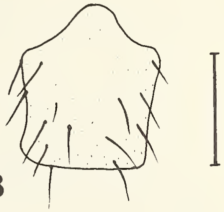

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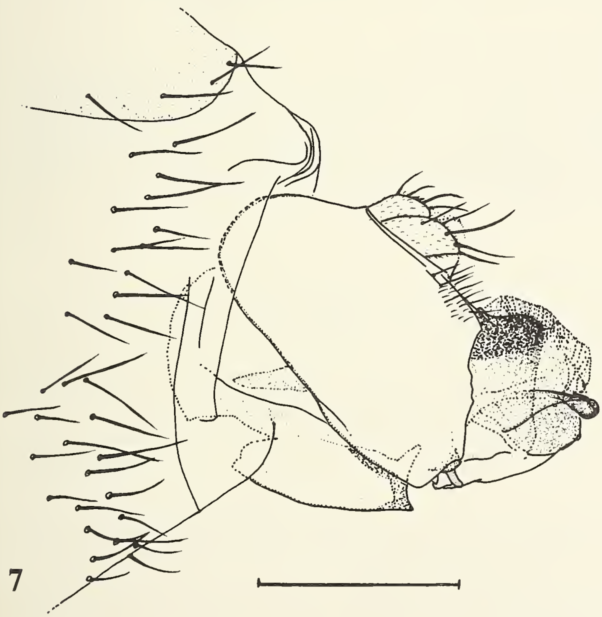

FIGURE 7
Gymnophora quartomollis hypopygium of male viewed from left side (scale line = 0.2 mm).

FIGURE 8
Gymnophora quartomollis tergite 8 of female abdomen (scale line = 0.1 mm).

WINGS: Axillary ridge with 1–5 hairs, with 13 out of 23 specimens having 2. Halteres dusky yellow to grey.

FEMALE ABDOMEN: Only segment 4 totally lacking a tergite, but that on segment 5 is not very clearly developed. The posterior part of tergite 7 is much longer and tergite 8 is an entirely different shape (Fig 8) to that of *G. healeyae* (Fig 5). The internal dark-walled sacs between segments 5 and 6 in *G. healeyae* are absent from *G. quartomollis.*

WINGS: Axillary ridge with 2–4 hairs (2, 3, 3, and 4 in the specimens examined). The costa before the tip of vein 1 is scarcely to obviously swollen, but in the latter case it does not narrow again so abruptly towards the tip of vein 1. Halteres dusky yellow to grey.

MATERIAL EXAMINED

Lectotype (see above). The following in the author's collection. ♂♂ Glasdrum NNR, Argyll (Grid ref 27/0046) 15 June 1978, leg A. G. Irwin. ♂ Taynish NNR, Argyll (Grid ref 16/7384) 16 June 1978, leg A. G. Irwin. ♂ + ♀ Glen Affric (Grid ref 28/2526) 23 June 1979, leg P. Skidmore. ♂♂ Finlarig Glen, Killin (Grid ref 27/574350) 3 July 1979, leg P. Skidmore. ♂♂ Falls of Lochay (Grid ref 27/535355) 4 and 6 July 1979, leg P. Skidmore. ♂♂ Camusurich (Grid ref 27/626346) 6 July 1979, leg P. Skidmore. ♀ Pass of Killiecrankie (Grid ref 22/9162) 4 August 1979, leg P. J. Chandler. ♀ Wayland Wood, Norfolk (Grid ref 52/9299) 10 June 1976, leg J. W. Ismay. In addition I have re-mounted on slides the following specimens in the British Museum (Natural History). ♂ Dean Forest, Gloucestershire, 14 June 1959, C. N. Colyer. ♂ Symondshyde, Herefordshire, 6 June 1949, C. N. Colyer. ♀ Newcastle, Co Durham, 13 July 1912, J. J. F. X. King.

KEY TO THE BRITISH SPECIES OF *GYMNOPHORA*

1. Oblique ridge of notopleuron (Fig 1) with posterior border pale (at least for lower two-thirds) with fringe of pale hair. Swelling of costa before tip of vein 1 sub-triangular and usually embracing a pale spot .... *arcuata* (Meigen)

—. Oblique ridge of notopleuron with posterior border black (as in Fig 1) in contrast to fringe of pale hair. Costa may or may not be with swelling before tip of vein 1, but when present it does not embrace a pale spot 2

2. Males 3

—. Females 4

3. Sixth abdominal segment with sides of venter bearing numerous hairs in more than one row (Fig 7). Hypopygium with relatively short cerci and of form shown in Fig 7........ *quartomollis* Schmitz

—. Sixth abdominal segment with sides of venter bearing a few hairs in a single row (Fig 2). Hypopygium with relatively long cerci and of form shown in Fig 2........ *healeyae* n.sp.

4. Internally between segments 5 and 6 there is a pair of dark-walled sacs (Fig 4). Frons with medio-lateral bristles present, which are more than half the length of the postero-laterals. Axillary ridge of wing bearing only 1 (rarely 2) hairs. Halteres with clear, pale yellow knob .... *healeyae* n.sp.

—. No such dark-walled sacs present. Frons usually lacking distinct medio-lateral bristles, but when present they are only half as long as postero-laterals or less. Axillary ridge of wing with 2 or more hairs. Halteres with dusky yellow to grey knob .... *quartomollis* Schmitz

ACKNOWLEDGEMENTS

I am grateful to Dr Theowald van Leeuwen for arranging the loan of the lectotype of *G. quartomollis* and to B. H. Cogan for allowing me to re-mount on slides some pinned

specimens from the British Museum. I am grateful to P. J. Chandler, Dr J. C. Coulson, Dr A. G. Irwin, Dr J. W. Ismay, and P. Skidmore for invaluable collections of fluid-preserved specimens. I am grateful to the Royal Society for grants to further my studies of Phoridae.

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NOTES ON YORKSHIRE MOLLUSCA — 2
ARION (KOBELTIA) DISTINCTUS MABILLE 1868 IN YORKSHIRE

A. NORRIS

Leeds City Museum

In recent years a great deal of work has been done by Mrs Stella Davies and others on the Common Garden Slug, *Arion (Kobeltia) hortensis* Ferussac 1819 and its segregates. In 1977 Stella Davies published a paper describing the differences between three different forms of *hortensis* which she labelled as forms A, B and R. It was evident from the work she had done, and from subsequent work on the group, that these three forms were indeed three distinct species.

Research into the synonomy of the *Arion (Kobeltia) hortensis* group established that one of the old names, *Arion distinctus* Mabille 1868, was valid and should be used for the form known as 'A'. A paper has recently been published, therefore (Davies 1979) establishing names for the three species.

Material collected and examined by myself from Yorkshire soon established that the common type in the area was form 'A'. It would seem, therefore, that the Common Garden Slug in Yorkshire is not *Arion (Kobeltia) hortensis*, but *Arion (Kobeltia) distinctus*.

At the present time the true *hortensis* must be considered as a comparatively rare species in Yorkshire and all old records of *Arion hortensis* should be considered as either invalid or in need of confirmation.

The third species described by Davies is *Arion (Kobeltia) owenii* Davies 1979; at present this species is unknown in Yorkshire.

Confirmed records of the *Arion hortensis* segregates are vary scarce at the moment for Yorkshire, so I would be pleased to examine and identify any material sent to me at the City Museum in Leeds. If every reader of *The Naturalist* could send me slugs from their own garden, we would soon have a better idea of the distribution of these three species.

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Davies, S. M. (1977). The *Arion hortensis* complex with notes on *A. intermedius* Normand. *J Conch, Lond* **29**: 173–87.

Davies, S. M. (1979). Segregates of the *Arion hortensis* complex (Pulmonata Arionidae) with the description of a new species, *Arion owenii. J Conch, Lond* **30**: 123–8.

BOOK REVIEWS

Flora of Baja California by **Ira L. Wiggins**. Pp xiv + 1025, with 970 line drawings and 4 maps. Stanford University Press, California. 1980. $65

This volume provides a comprehensive taxonomic treatment of the flora of two peninsular States of Mexico: Baja California Norte and Baja California Sud, which cover an area of 143,790 km^2 and stretch south-eastwards from California (USA) for a distance of 1300 km, being 240 and 30 km across at the broadest and narrowest points respectively; there are also many offshore islands. The terrain is varied, and a series of mountain ranges (up to 3096 m) run the full length of the peninsula.

The climate is hot and dry: midday temperatures can reach 50°C or more in the summer, but fierce storms occur during the winter. Annual rainfall diminishes southwards from 800 to 50 mm. Desert, coniferous forest, montane, arid tropical, coastal dune and marsh, mangrove swamp, scrub, freshwater, etc, plant communities are well represented in a flora consisting of 2,705 species — but the endemic component is relatively low.

Forty-eight pages of introduction include physiographic, geological, hydrological, climatological, and ecological information; this is supported by four useful maps, but the scales to three of these are unfortunately erroneous. A section on botanical exploration is also included in the introduction.

The main body of the text contains descriptions and illustrations of, and keys to the identification of, pteridophytes and spermatophytes. A glossary (thirty-four pages), bibliography and index are also provided.

Like *Flora of Barro Colorado Island* published by the same press (see *Naturalist* **104**: 129), this work combines scholarship with aesthetic appeal: once again both author and publisher are to be congratulated.

MRDS

Fungal Saprophytism by **Harry J. Hudson**. Pp iv + 76, including numerous text figures and tables. Studies in Biology No 32, Institute of Biology/Edward Arnold. 2nd edn, 1980. £2.75 paperback

Revision of a concise but informative study of saprophytic fungi first published in 1972. The approach is essentially ecological: no attempt has been made to give a taxonomic treatment, but a wide range of fungi involved in plant decomposition and in the maintenance of the carbon and mineral cycles are most adequately reviewed.

Other new paperback titles/editions recently published in this series include: **Medical Mycology** by **Mary P. English** (Pp vi + 57; £2.50), **The Body Fluids and their Functions** by **Garth Chapman** (Pp iv + 75; 2nd edn; £2.75), and **Social Behaviour of Animals** by **John M. Deag** (Pp iv + 92; £3.20).

Landscape History. Journal of the Society for Landscape Studies edited by **Margaret L. Faull**. Volume 1 (1979). Pp v + 89, illustrated. Available from the editor at 3 Benjamin Street, Wakefield WF2 9AN. £7

The first issue of this journal contains nine papers presented at the inaugural conference of the Society, and reflect its aim — namely 'to promote the study of the interaction of man and his environment as reflected in the face of the landscape'. Most of the papers contain material of Yorkshire interest, particularly 'The use of place-names in reconstructing the historic landscape; illustrated by names from Adel township' by Margaret L. Faull, and 'Documentary evidence for the landscape of the Manor of Wakefield during the Middle Ages' by Stephen A. Moorhouse. Three papers, 'Aerial archaeology and the prehistoric landscape' by James Pickering, 'Environmental issues in landscape studies' by Richard Smith, and 'Documentary evidence for the historical ecologist' by Oliver Rackham, will be of great interest to the natural historian, ecologist and environmentalist. Forthcoming issues are awaited with interest.

ON THE ROLE OF *TRICHOCERA* LARVAE (DIPTERA, TRICHOCERIDAE) IN THE DECOMPOSITION OF CARRION IN WINTER

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Introduction

The role of dipterous larvae in the decomposition of carrion in natural conditions has been the subject of much research by entomologists in recent years. However, these researches were invariably carried out during the summer months when Diptera are most active. The effect of the larvae of Diptera on carrion decomposition in winter has not been studied in any systematic manner, and for this reason I decided to carry out some investigations in this field in my garden in Harrogate during the winter of 1979–80.

Materials and Methods

The carrion bait used in this study was half a pound of ox heart meat. The bait was placed on the edge of a lawn and covered by a simple trap. This trap was made from a plastic plant pot (15 cm wide at the base × 30 cm high) with its base removed and a piece of fine muslin attached in its place. Two 2 cm wide slits were cut on either side of the pot to allow insects to enter. Such traps are widely used in work of this sort. With a few exceptions, the trap was examined every evening by torchlight. Ammonia vapour was used to temporarily immobilize the insects, which were then collected with forceps. The piece of carrion was then itself removed, examined under a binocular microscope and replaced in the trap. The study was begun on 8 December 1979 and was terminated on 1 March 1980.

Results

The first fly observed on the carrion was a female blowfly, *Calliphora vicina*, collected on 9 December, and later that day two winter gnats, *Trichocera* sp., were seen flying off the carrion when I went to examine it. (Ammonia vapour is not very effective against winter gnats and a large dose was found necessary to immobilize them). The following day two specimens of *Trichocera annulata* were collected from the trap. *T. annulata* continued to be attracted to the carrion until 5 January after which they were not seen in the trap again, although they continued to be common in the garden. All the specimens collected were females. The first eggs were observed on 15 December and the first larvae appeared on 20 January. About ten or twelve larvae were seen crawling on the carrion; they were mostly the sluggish larvae of *Trichocera*, but a couple of very active Muscid larvae were also seen. The number of *Trichocera* larvae continued to increase, reaching a maximum during the first week in February when larvae of many sizes were very abundant indeed. When viewed under the microscope, the larvae were seen either to be tunnelling sluggishly in and out of the carrion with their mandibles continuously working, or resting embedded in it with only the posterior spiracles to the exterior. Occasionally, some of the larvae would submerge themselves completely for a few seconds while closing the posterior lobes over the spiracles. No Muscid larvae were seen again. By the end of February most of the larvae had left the carrion to pupate in the soil, by which time little of the carrion remained, except some of the fatty parts which were not colonized by the larvae. Samples of larvae were collected at intervals during the course of this study; some were preserved in 70 per cent alcohol and an attempt was made to rear the rest. However, I succeeded in rearing only one specimen, which proved to be a female *T. annulata*.

Other insects associated with the carrion were Collembola, which occurred on the carrion when it started to turn rancid late in December. Truly vast numbers of Collembola occurred on the carrion during the first week of February, which coincided with the maximum number

of *Trichocera* larvae. It was a very cold week, with heavy snow showers. The only other insects collected during the course of this study were:

2	*Calliphora vicina* (Calliphoridae)	9 and 14 December
1	*Telmatoscopus notabilis* (Psychodidae)	11 December
1	*Copromyza nitida* (Sphearoceridae)	16 December

Discussion

The role of Diptera larvae in the decomposition of carrion has long been appreciated, but no systematic study of the situation in winter exists in the literature. The above rather limited observations serve to show that *Trichocera* can play a major role in carrion decomposition in winter, but a great deal more work remains to be carried out on the subject. The species of *Trichocera* are usually regarded as being breeders in decaying vegetable matter, such as compost heaps or rotting potatoes, and nowhere in the literature could I find a reference to any British species of *Trichocera* breeding in carrion or decaying animal matter. Both Keilin and Tate (1940) and Freeman (1950) state that *Trichocera* breed in decaying matter of vegetable origin and make no mention of carrion. Dear (1978) lists the families of European Diptera that have been recorded as visiting carrion, but the family Trichoceridae does not appear on the list. From the above results it is clear that Trichocerids can breed in carrion, but how widespread this habit is remains to be seen.

Acknowledgements

I would like to thank Mr K. G. V. Smith of the British Museum (Natural History) for much helpful advice during the course of my carrion work. I also thank Dr R. H. L. Disney of the Malham Tarn Field Centre for identifying the specimen of *Copromyza*.

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MACROPHYTES OF THE HUDDERSFIELD NARROW CANAL — A PRELIMINARY SURVEY

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Casual observations made over the past three years have suggested that the aquatic vegetation of the Huddersfield Narrow is distributed zonally. Since vegetation provides important structural and nutritional elements in the habitats of many freshwater animals, some of which have already been shown to exhibit zonal patterns of distribution at this site (Watkin and Morphy, 1976; Morphy *et al*, 1977), a survey of the canal vegetation represented a logical development of previous studies. The study was also prompted by an issue of another kind: late in 1977 a report was published by Kirklees Metropolitan Council on the development of the canal as a recreational resource. Work involving the upgrading of the tow path began in the spring of 1978, but some channel clearance had already begun by the autumn of that year. In view of these developments, the planned survey was brought forward to enable an assessment of the composition and distribution of canal vegetation to be made prior to any channel clearance. It was believed that such information, together with that from earlier studies, would be useful both as a base-line against which future changes could be measured and as a basis for negotiating some measure of protection for certain of the more biologically valuable reaches of the canal.

This paper reports the results of a preliminary survey of the macrophytes of the canal channel.

Methods

The survey was carried out over a period of one week in August 1978, and involved sampling and recording at 200 metre intervals down the length of the canal. At each station a list was made of all the species observed within the canal channel at that point and specimens of each species of plant were collected for identification or confirmation of identification. The decision to collect material proved an important one, since certain species could have been misidentified in the field.

As conditions in the canal channel vary considerably because of variations in water level and the degree of siltation, the survey included not only true aquatics, but also emergent vegetation and some species characteristic of drier habitats.

Results

Table 1 shows the distribution of the species arranged in order of first appearance. The stations correspond to those given in Morphy *et al* (1977) which should be used in conjunction with the map given in Watkin and Morphy (1976).

The upper section of the canal comprising stations 1 to 4 is a reasonably homogeneous reach, which is uninterrupted by locks and is thus one of the largest pounds on the Narrow canal. Two of the eight species present were confined to this reach, viz *Eleocharis acicularis* and *Juncus bulbosus*. In addition *Sparganium emersum* and to a lesser extent *Alisma plantago-aquatica* appeared to be more characteristic of the upper reach than of other reaches of the canal. *Sparganium emersum* extended down to station 5, whilst *Alisma plantago-aquatica* occurred predominantly in the first ten stations and did not appear again until stations 36 and 37.

Below station 4 the canal changes dramatically in character as it passes down through a series of nine locks over a distance of about 1 kilometre. This produces a zone of a considerable disturbance and heterogeneity. From stations 5 to 14 a further fifteen species appeared. Of these *Epilobium hirsutum* and *Elodea canadensis* occurred throughout much of the remainder of the canal, whereas *Lemna gibba* and *Iris pseudacorus* were restricted to this reach. By contrast *Lemna minor* showed a markedly disjunct distribution, which featured a zone of absence in the middle section of the canal (stations 12 to 32).

TABLE 1 – **The distribution of macrophytes along the Huddersfield Narrow Canal**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Callitriche sp.	x	x	x	x	x					x												x	x	x			x					x					x	x	x	x		x	x		x				x											
Juncus effusus	x		x	x		x		x	x		x	x	x	x	x			x	x		x	x					x	x									x																							
Sparganium emersum	x	x	x		x																																																								
Alisma plantago-aquatica	x	x	x	x	x	x			x	x																										x	x																							
Glyceria fluitans	x		x	x	x	x		x		x					x		x	x		x							x										x																							
Juncus bulbosus		x																																																									
Eleocharis acicularis		x																																																									
Elodea canadensis					x	x	x	x		x	x	x	x		x	x							x		x	x				x		x	x		x	x		x	x	x	x	x	x	x	x			x										x		
Equisetum fluviatile					x	x	x				x	x		x	x	x		x	x									x					x	x				x											x											
Phalaris arundinacea					x													x	x	x	x	x	x					x		x			x	x			x	x				x							x	x	x									
Epilobium hirsutum						x		x	x		x	x		x			x	x	x		x	x	x		x	x	x	x		x				x	x	x	x		x	x	x	x	x	x	x			x	x	x	x		x		x			x	x	
Typha latifolia						x																x					x	x		x		x					x				x					x	x													
Lemna minor								x	x	x	x																					x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x	x	x	x	x			x	x	
Lemna gibba								x	x																																																			
Lycopus europaeus									x		x	x	x	x	x	x	x	x	x	x	x	x					x	x		x	x		x	x		x	x	x	x	x	x	x								x		x	x	x					x	
Iris pseudacorus										x	x	x		x																																														
Veronica beccabunga											x																																																	
Angelica sylvestris											x	x		x	x	x	x	x	x		x	x					x			x		x			x	x																								
Galium palustre												x			x			x	x																x	x																								
Ranunculus flammula													x		x	x		x		x	x	x											x																											
Hydrocotyle vulgaris														x				x																																									
Caltha palustris														x																																													
Barbarea vulgaris																	x																																										
Carex remota																				x		x											x																											
Luronium natans																										x																																		
Ranunculus omiophyllus																											x																																
Oenanthe crocata																											x	x																															
Stachys palustris																												x		x	x		x	x	x		x	x	x						x															x	
Impatiens glandulifera																												x		x						x	x	x	x											x											
Bidens tripartita																														x						x	x								x							x	x							x	
Solanum dulcamara																																x	x		x			x	x											x										
Rorippa nasturtium-aquaticum																																x	x	x		x	x	x																						
Polygonum persicaria																																				x	x																							
Leontodon autumnalis																																					x																							
Epilobium adenocaulon																																						x																						
Acorus calamus																																							x	x	x				x	x	x		x	x										
Scutellaria galericulata																																										x			x															
Egeria densa																																																	x											
Lagarosiphon major																																																	x	x	x	x	x	x	x	x	x			
Potamogeton berchtoldii																																																									x	x		x
Vallisneria spiralis																																																										x		
Potamogeton crispus																																																												x
Potamogeton natans																																																												x
Glyceria maxima																																																												x

TABLE 1 – **The distribution of macrophytes along the Huddersfield Narrow Canal**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Callitriche sp.	X	X	X	X	X					X												X	X	X			X					X					X	X	X	X		X	X		X				X											
Juncus effusus	X		X	X		X		X	X		X	X	X	X	X			X	X		X	X					X	X									X																							
Sparganium emersum	X	X	X		X																																																							
Alisma plantago-aquatica	X	X	X	X	X	X			X	X																										X	X																							
Glyceria fluitans	X		X	X	X	X		X		X					X		X	X		X							X										X																							
Juncas bulbosus		X																																																										
Eleocharis acicularis		X																																																										
Elodea canadensis					X	X	X	X		X	X	X	X		X	X							X		X	X				X		X	X		X	X		X	X	X	X	X	X	X	X			X										X		
Equisetum fluviatile					X	X	X				X	X		X	X	X		X	X									X					X	X				X											X											
Phalaris arundinacea					X													X	X	X	X	X	X					X		X			X	X			X	X				X							X	X	X									
Epilobium hirsutum						X		X	X		X	X		X			X	X	X		X	X	X		X	X	X	X		X				X	X	X	X		X	X	X	X	X	X	X			X	X	X	X		X		X			X	X	
Typha latifolia						X																X					X	X		X		X					X				X					X	X													
Lemna minor								X	X	X	X																					X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X			X	X	
Lemna gibba								X	X																																																			
Lycopus europaeus									X		X	X	X	X	X	X	X	X	X	X	X	X					X	X		X	X		X	X		X	X	X	X	X	X	X								X		X	X	X					X	
Iris pseudacorus										X	X	X		X																																														
Veronica beccabunga											X																																																	
Angelica sylvestris											X	X		X	X	X	X	X	X		X	X					X			X		X			X	X																								
Galium palustre												X			X			X	X																X	X																								
Ranunculus flammula													X		X	X		X		X	X	X											X																											
Hydrocotyle vulgaris														X				X																																										
Caltha palustris														X																																														
Barbarea vulgaris																	X																																										
Carex remota																				X		X											X																											
Luronium natans																										X																																		
Ranunculus omiophyllus																											X																																	
Oenanthe crocata																											X	X																																
Stachys palustris																												X		X	X		X	X	X		X	X	X					X															X	
Impatiens glandulifera																												X		X						X	X	X	X										X											
Bidens tripartita																														X						X	X								X							X	X						X	
Solanum dulcamara																																X	X		X			X	X											X										
Rorippa nasturtium-aquaticum																																X	X	X		X	X	X																						
Polygonum persicaria																																				X	X																							
Leontodon autumnalis																																					X																							
Epilobium adenocaulon																																						X																						
Acorus calamus																																							X	X	X				X	X	X		X	X										
Scutellaria galericulata																																										X			X															
Egeria densa																																																	X											
Lagarosiphon major																																																	X	X	X	X	X	X	X	X	X			
Potamogeton berchtoldii																																																									X	X		X
Vallisneria spiralis																																																										X		
Potamogeton crispus																																																												X
Potamogeton natans																																																												X
Glyceria maxima																																																												X

Over the next ten stations (15 to 24) the canal is characterized by long pounds and only two further species appeared, *Barbarea vulgaris* and *Carex remota.* Below station 24 the canal passes by way of a culvert through Slaithwaite.

From the figure it is evident that station 25 marked the beginning of a zone of significant and rapid vegetational change, which is indicated by the addition of a further eleven species over the next fourteen stations (25–38). Stations 26 and 27 featured *Luronium natans* and *Ranunculus omiophyllus* respectively. At station 28 the occurrence for the first time of *Stachys palustris* and *Impatiens glandulifera* caused a conspicuous scene-change, and these two species together with *Solanum dulcamara* and *Rorippa nasturtium-aquaticum* characterized stations 28–39. This reach also marked the lower limit of occurrence for a number of species, notably *Alisma plantago-aquatica, Glyceria fluitans, Angelica sylvestris, Galium palustre* and *Ranunculus flammula.* From station 39 there followed a zone of relatively little vegetational change, typified by *Acorus calamus.*

Station 49 marked the beginning of another distinctive zone. This extended down to station 58 but there was some interruption in sampling coverage between stations 56 and 57, where the canal passes for some 600 metres through culverted and otherwise inaccessible sections. This reach featured three alien species of which *Lagarosiphon major* was the most widespread, occurring throughout. This species has a similar life-form to *Elodea canadensis* and in the Huddersfield Narrow canal these two species appeared to be mutually exclusive in their patterns of distribution. The other two species *Egeria densa* and *Vallisneria spiralis* were restricted to stations 49 and 58 respectively. *Egeria densa* was observed in flower. Station 57 marked the upper limit of the occurrence of *Potamogeton berchtoldii* which was recorded at three out of the last four stations.

At station 59 the canal broadens to its junction with the Sir John Ramsden canal at Huddersfield Wharf and here the flow is augmented by water from the Colne which enters the canal by Aspley Goit (also known as Shaw Foot Mill tail-goit). Below this point, at station 60, three further species were recorded, *Potamogeton crispus*, *P. natans* and *Glyceria maxima.*

Discussion

On the basis of information provided by local recorders and of the maps presented in Perring and Walters (1962) the following appear to be new recordings for the 10 × 10 km grid-squares, 44/01 and 44/11.

44/01

Rorippa nasturtium-aquaticum
Lycopus europaeus
Potamogeton natans
Iris pseudacorus
Lemna gibba
Sparganium emersum
Eleocharis acicularis

44/11

Epilobium adenocaulon
Potamogeton berchtoldii
Glyceria maxima
Egeria densa
Lagarosiphon major

Of these, several deserve particular mention. Both *Lemna gibba* and *Epilobium adenocaulon* occur predominantly in the south-east of Britain (Perring and Walters, 1962). In VC 63 *Lemna gibba* appears to be rare with only two previously recorded localities, at Luddenden Foot and Shipley. *Epilobium adenocaulon* is an introduced species which was first recorded in Britain in 1891, and has since spread rapidly, particularly in south-east England (Clapham *et al*, 1962). According to the YNU Recorder for Aliens, Mrs F. Houseman, *E. adenocaulon* has been recorded at only one other locality in VC 63, in the Ripponden area in 1973.

Lagarosiphon major can be considered with *Egeria densa* and *Villisneria spiralis* since they all occurred in the lower part of the canal and share the characteristics of being aliens whose occurrence may be attributed to some extent to the activities of aquarists (Kent, 1955; Edwards, 1961). *L. major* is a native of South Africa, *E. densa* of South and Central America, and *V. spiralis* is widely distributed in warmer parts of the world from Central France southwards (Clapham *et al*, 1962; Haslam *et al*, 1975). Both *L. major* and *E. densa*

were first recorded in Britain in 1953 at Droylsden in South Lancashire in a section of the Ashton Canal which was warmed by waste water from cotton mills (Kent, 1955; Edwards, 1961), *V. spiralis* also shares this association with heated water (Clapham *et al*, 1962). It is therefore significant that station 49 lies immediately below a section of the canal which until 1973 was warmed by a substantial inflow of heated water from one of the canal-side mills. Moreover, this is the only part of the Huddersfield Narrow to have been affected in this way in recent years. As little is known of the extent to which these plants can withstand British winter temperatures, it is not possible to predict what may happen at this site. *Lagarosiphon major* does not seem to require unusually high temperatures for it has become established in unheated waters in the warmer counties of England. For the other two species Sculthorpe (1967) has suggested that temperature may be the prime factor controlling their distributions in Britain. It is noteworthy then that *E. densa* was observed in flower some five years after the warming effect ceased, which is contrary to the finding of Edwards (1961).

The detailed distributions of these aliens in Britain are difficult to ascertain since, with the exception of *V. spiralis*, they are not featured in Perring and Walters (1962). *L. major* has been reported for South Lancashire, West Cornwall, Surrey, and Bedfordshire (Kent, 1955), and more recently Haslam *et al* (1975) have described it as local or rare in Kent, Surrey, Essex, Wiltshire, Derbyshire, Lancashire, and Monmouth but indicated that it was increasing its range. There are no previous recorded reports for this species in Yorkshire. However, there is an unrecorded report for the Elland area. *E. densa* by contrast is restricted to South Lancashire (Kent, 1955; Clapham *et al*, 1962), and West Yorkshire where it was recorded in the canal near Elland in 1963 (Houseman, 1964). The present finds coincided with the discovery of a further site for these two aliens in the Brighouse area and a paper dealing with certain aspects of the biology and distribution of these two species is now in preparation (Lucas, Morphy and Toms, *in prep*).

For *Vallisneria spiralis*, the third member of this trio of aliens, the map in Perring and Walters (1962) shows records for only six 10 × 10 km grid-squares, centred upon West Gloucester, South-West Yorkshire and South Lancashire. The Yorkshire records include one for the canal at Skipton on the boundary between VC 63 and VC 64, and another for the Sir John Ramsden Canal. For the latter only the date, 1956, is given. Though unrecorded, the present locality, in what was formerly a warmed length of the Narrow Canal, has been known for many years. Moreover, it seems possible that this colony originated from material transplanted into the same canal pound, over twenty-five years ago at a point only about 100 metres downstream of its present position. The material was brought from a canal at Salterhebble, near Halifax, a former *Vallisneria* habitat which has since been drained. If this interpretation is correct, the colony has maintained a foothold here for a considerable period and, since 1954, without the aid of artificial warmth. A downstream movement of material from this source may have given rise to the colony reported for the Sir John Ramsden Canal *(V. supra)*.

In addition to its aliens, the canal also provides habitats for some other native water plants that are by no means common in Britain, notably *Luronium natans* and *Eleocharis acicularis*. The former species was first recorded at this site by Fryer (1952) and it is encouraging to find that it has maintained a presence there for nearly thirty years. Unfortunately the rapid rate of siltation and the remedy of channel clearance both pose threats for the future survival of *L. natans* at this site.

Whilst these studies prompt further enquiries of an ecological kind, they also draw attention to the problem of qualification for protected status. In the absence of absolute standards for site evaluation (Ratcliffe, 1977), or of detailed studies of other canals which might provide a basis for comparative assessment, it is difficult to estimate the relative worth of the Huddersfield Narrow as a wildlife habitat. Nevertheless, in terms of its limited size, relative richness, its significant component of rare species, its rapid zonal change, and its possible vulnerability, it might well be considered a possible candidate. Moreover, its former strategic position as an artificial link between the great river-basins to the east and west of the Pennines, together with its distinctive industrial microhabitats, which show marked affinities with similar habitats in the Lancashire area (Fox, 1963; Shaw, 1963; Weiss and

Murray, 1909), may suggest the need for some protection for this and other similar relict habitats of the industrial era.

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BOOK REVIEWS

Sun, Sand and Snakes by **Stephen Spawls**. Pp 254, with 17 colour plates. Collins Harvill. 1979. £6.95

In Britain, with only three species of small snakes, we have a poor representation of these animals. It is only after reading the account by Stephen Spawls of his snake catching activities in Kenya that one comes to appreciate the range of snake form, colour, behaviour, and activity. This is an account of a young man's enthusiasm and dedication to snake catching. (We are not told much of their ultimate fate except that they go to zoos.) His informative account of their natural history is interspersed with humorous anecdotes.

When I first picked up this book I groaned inwardly at the prospect of yet another somewhat superficial account of natural history in East Africa, but my pessimism proved unjustified. Spawls writes well and some of his descriptions of the Kenyan landscape are quite outstanding. It is probably this facility, together with the pleasantly presented and balanced account, that made me feel most favourably disposed to this lighthearted account.

MJD

Evolution for Naturalists: The Simple Principles and Complex Reality by **Philip J. Darlington**. Pp xvi + 262, with 9 figures (tone drawings and line illustrations). Wiley. 1980. £12.75

A book on evolution by a seventy-five-year-old American Emeritus Professor seems an unlikely candidate for the shelves of British naturalists. Indeed, British or not, the potential purchaser may be put off by looking only at the jacket or the frontispiece. The jacket design includes a 'tree' of branching lines originating in a mysterious protoplasmic blob, and terminating in two stylized clothed human silhouettes, male and female, of the type that appear on certain doors. The frontispiece is a drawing of Darwin in slacks, casual shirt, and platform soled shoes, 'as he might have looked as a modern graduate student'. This is trivialization of the subject. If the potential reader does not put the book down, and samples the text, he is likely to be more impressed. The book provides a history of evolutionary ideas and evidence for evolution; methods for the study of evolution are described, and discussions of set selection, group selection and kin selection are included. Opportunities for naturalists themselves to make relevant observations are suggested; unfortunately for British readers emphasis is on North American material. There is a factual and phylogenetic account of the evolution of life on earth, and a most interesting chapter — the last — is devoted to evolutionary philosophy and ethics. Darlington, a competent evolutionist, is 'awed by recent spectacular advances in the understanding of life'. Nevertheless he has evidently kept abreast of modern evolutionary literature, and is not above a sideswipe at *some* of the more mathematical material published in recent years.

The author is obviously greatly impressed by Darwin, particularly by Darwin as a young man, and goes to considerable lengths to illustrate his massive contribution and to refute some modern denigrators. Poor Alfred Russel Wallace who also propounded (by proxy) the theory of evolution by natural selection to the Linnean Society at the same meeting as Darwin in 1858 (not to the Royal Society as Darlington asserts) is largely ignored.

The nine figures are not all of much help towards an understanding of evolution: the three inset line drawings of beetles on Fig 2, which show the occurrence of three species in the southern Appalachians, provide the reader with a spot-the-difference problem; a drawing of a carabid beetle, Fig 4, with 'wing vestiges not shown' fails thereby in its object to illustrate the relevant features of the wingless morph in a dimorphic population.

Each of the chapters concludes with a classified reading and references list to assist naturalists to find further material. An understanding of evolution, including a knowledge of man's own inherent limits, conflicts and needs, and of the misuse of evolutionary theory to justify racial discrimination, is an essential part of the intellectual equipment of an educated person. This book will help naturalists, and those professional biologists for whom evolution is no longer of day-to-day concern, towards such an understanding. I would recommend it for libraries, and, with a little less confidence, for purchase by naturalists requiring a handy source of ideas and references.

DJH

ON TWO BRITISH *ATHALIA* SPECIES (HYMENOPTERA, TENTHREDINIDAE)

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ABSTRACT

Athalia liberta (Klug) is newly recorded in Scotland from three widely separated localities south of the Forth-Clyde line. Distribution of this sawfly may be extending northwards. *Teucrium scorodonia* L. is a new hostplant record for *A. cordata* Lepeletier.

Athalia liberta (Klug)

This species was first satisfactorily distinguished by Benson (1931a). Before the publication of Benson's work, several species were confused and it is therefore unwise to trust most published records by earlier entomologists. Benson (1952, p 83) recorded *liberta* as 'Widespread in England and also in Ireland but usually uncommon'. He gave a more detailed account of its known distribution when he first published the species as British. In view of the observations which are made below, it is worthwhile quoting from Benson's (1931a) notes on *liberta*: 'The species has been found from May to August and is probably double-brooded. It does not appear to be a really common species, though probably widely distributed. I have taken specimens in marshy places, at the edges of woods and in gardens. I have examined specimens from the following English counties: Cornwall, Devonshire, Dorsetshire, Oxfordshire, Bedfordshire, Northhamptonshire, Cambridgeshire and Suffolk; and from Cork in Ireland.'

On 24 June 1980 my colleague Mr A. D. Leslie collected 6 ♀♀ and 2 ♂♂ from *Alliaria petiolata* (Bieb.) Cav. & Grande growing beside the Union Canal in South Edinburgh, Midlothian. This reminded me that I had found it earlier in the year in upland country at Leadhills, Lanarkshire (1 ♂, 18 May 1980), where it flew in a damp stream course with *A. lugens* Klug. The male of *liberta* is not yet separated from that of *cornubiae* Benson. But since the latter has a southern distribution, is normally very scarce and likes dry, warm places with rocks or disturbed soil (Liston, 1980), it is most unlikely that this species occurs in Lanarkshire. What plant *liberta* was using at Leadhills is uncertain. The hosts on which it is definitely known to feed are *Alliaria petiolata*, *Cardamine hirsuta* L., *Sisymbrium officinale* (L.) Scop. and *Arabidopsis thaliana* (L.) Heynh. (all Cruciferae) and none of these was present in the immediate area at Leadhills, but solitary vagrant specimens of lowland *Athalia* spp. are sometimes found high above their breeding areas (Liston, l.c.).

While walking along the River Tweed near Kelso, Roxburghshire, on 28 June 1980 I found females only to be common on *A. petiolata*, especially where this plant grew next to field hedges.

The discovery of this insect in Scotland raises some interesting questions. There are no specimens of *liberta* in the Royal Scottish Museum from Scotland and this may indicate that it did not occur here when the older collectors were active. The absence of specimens is surprising considering the numbers in which Mr Leslie and I found it. Furthermore, I have not seen it at the first two localities during fairly intensive collecting over the past few years. I have reason to think that it was *liberta* which I saw beside the Tweed in June 1979. This species may be extending its range, as *A. bicolor* Lepeletier did during the 1940s (Benson, 1962). It is very interesting that *A. liberta* shares its main foodplant *(Alliaria petiolata)* with the Orange Tip butterfly *(Anthocharis cardamines* L.) which has extended its breeding range in Scotland greatly during the past few years. Further evidence for an extension in the range of this sawfly would be very interesting. It is remarkable, though perhaps not merely coincidence, that the Orange Tip was found on the Union Canal in 1977 (Smith, 1977). Before its range started to extend it was restricted to localities in Roxburghshire (Smith, 1976). There has been no completely satisfactory explanation for well documented expansions in the breeding areas of several British butterflies that have taken place this

century. If *A. liberta* is extending its range along with the butterfly, this would indicate that the reason for this particular expansion was controlled by one or more climatic factors rather than a biotic factor such as abundance of parasites, which would probably only affect one species.

It is also worth noting that just as certain years bring many species of migrant Lepidoptera to Britain that do not actually fly here together, so certain species of *Athalia*, though less well recorded, seem to become more common during the same periods of years even though they have different foodplants and are not sympatric. Both *rosae* (L.) and *bicolor* Lep. became more common during the 1940s, for example. *Athalia* also contains the only known British migrant Symphyta. *A. rosae* has difficulty in maintaining itself in Britain and is replenished by migrations from Continental Europe (Benson, 1931b).

Recording the local distribution and abundance of certain *Athalia* spp. from year to year would be most worthwhile and I recommend the possibly extending range of *liberta* as a subject for exploration.

A. cordata Lepeletier

Larvae and adults were found on *Teucrium scorodonia* L. in a birch wood in the upper Whitadder Valley, E Lothian on 8 August 1979, and on the same species at Glentress Forest, Peebleshire the following day. Previous foodplant records include *Ajuga* spp. (both wild and garden vars), *Antirrhinum* and *Plantago* spp.

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BOOK REVIEW

Hunting and Stalking Deer in Britain through the Ages by **G. Kenneth Whitehead**. Pp 304, with numerous illustrations in black and white. Batsford. 1980. £17.50

This book is social history, but inevitably it has much to say about natural history as well. Two species of deer (Red deer and Roe deer) are native to Britain, and four other species have been introduced and are well established. In fact the deer population in the country today is as high as it has ever been, and control of their numbers is essential. Traditionally this has been done by hunting, but nowadays only the Red deer in south-west England and the introduced Fallow deer in the New Forest are hunted. In Scotland Red deer stalking has become an important part of the tourist industry. Elsewhere control is by shooting, and as the author remarks, in some quarters it is regarded as important that 'those entrusted with the "culling" go about their business without a flicker of enjoyment on their faces'. A wealth of information is brought together here for the first time, and the book is well produced, well illustrated and well indexed.

FHB

SOME BRACKISH-WATER DIATOMS FROM SALINE POOLS IN THE MICKLETOWN AREA

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Attention was first drawn by Brook (1976) to a series of seven shallow pools near Castleford, South Yorkshire, which have an unusually high content of dissolved salts, apparently due to leaching from heaps of the pit spoil. The pools are connected by channels, and chemical analyses (Fryer, 1978) show that there is a consistent decrease in dissolved salts in the direction of flow, from west to east. Thus Mickletown flash, the highest pool (and furthest west), has the greatest concentration while the seventh, Boat Lane Ing, has the lowest. Fryer also showed the presence of a number of species of Crustacea typical of brackish-water habitats, while Ruttner-Kolisko (1979) found brackish-water rotifers.

TABLE 1

The distribution of fifteen species of brackish-water diatoms in samples from the Mickletown Lagoons. C = common; O = occasional; and R = rare.

	Mickletown Flash	Pool near Mickletown Flash	Pool west of Cutler Lane Ing	Cutler Lane Ing	New Flash	The Whinney	Boat Lane Ing
Amphiprora alata	O	O	O	O			
A. paludosa	O	O	O				
Anomoeneis sphaerophora			O	O			
Berkeleya rutilans	R						
Navicula halophila			O				
N. salinarum	O	O	O	O			
Nitzschia filiformis		O	O	O			
N. sigma			O	O			
N. tryblionella	O		O	O			
Pleurosigma strigosum	O						
Stauroneis spicula	R						
Surirella ovalis	O			O			
S. striatula	O		O	O			
Synedra pulchella	C	C	C	C	C	C	C
S. tabulata	C	C	C	C	C	C	C

It seemed likely that the pools would contain species of diatoms characteristic of similar habitats and, in order that we might look for these, Geoffrey Fryer sent us material from his samples collected for Crustacea. Lists of diatoms from each pool were made and were found to include a number of species known to favour brackish water.

The occurrence and relative frequency of fifteen brackish-water species of diatoms are recorded in Table 1, the pools being arranged in decreasing order of total salt content. Only *Synedra pulchella* and *S. tabulata* were found in all pools, with none but these two species occurring in the lowest three. The number of individuals was low for most species and, in the case of *Berkeleya rutilans*, only one frustule was noted. However, since the samples were collected for their animal content, this pattern of distribution of the diatoms must be regarded as provisional until it can be amplified by additional data.

On the mainland of Europe the diatom flora of inland saline habitats has been studied in detail but there seems to be little published information on similar sites in Britain (Belcher and Swale, 1980). A closer examination of the Mickletown pools would probably be rewarding.

We wish to thank Dr Geoffrey Fryer for sending us the samples.

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BOOK REVIEWS

The Red Fox by **H. G. Lloyd**. Pp 320, with 28 figures and 29 monochrome plates. Batsford. 1980. £15

The fox is an animal that attracts considerable interest and arouses many emotions. To the farmer it is a pest, to the huntsman a quarry for sport and to the medical officer of health the potential lead animal in the transmission of rabies. With this general and widespread interest it is an opportune time for an authoritative volume to appear on the biology of this animal, and who better to write it than H. G. Lloyd, who has been engaged for many years on field research on the fox.

This is an excellent account which initially considers, in appreciable detail and with considerable supporting evidence, the food, breeding and development, population dynamics and movement behaviour. The later chapters look more closely at the relations with man and the methods and effects of control. The account as a whole is well balanced and clearly written. One has no hesitation in recommending this book to anyone, whether he be amateur naturalist, professional biologist, field sportsman or huntsman with an interest in British carnivores. It is likely to remain the definitive account for many years to come.

MJD

Parrots, their Care and Breeding by **Rosemary Low**. Pp 654. Blandford. 1980. £22

A useful practical guide to parrots, and a delightful book. The author states with a cautionary note that will appeal to conservationists: 'My fervent hope is that this book will encourage aviculturists to think in terms of being self-sufficient. The era when fewer imports of wild-caught birds occur may be nearer than is realized'. Part 1 gives details of care and breeding for all species, with many case histories and useful tips. Part 2 is a systematic introduction to all kinds of parrots, parrakeets and lovebirds with ninety-one excellent colour photographs, and good indexing. I am not a parrot-fancier but if I were I would find this book a great comfort, and good reading for winter evenings besides.

BS

THE DISTRIBUTION OF DESMIDS IN SOME TARNS IN THE ENGLISH LAKE DISTRICT

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INTRODUCTION

Desmids tend to be present in all but the most acid or most alkaline ponds and lakes and, although the abundance and occurrence of particular species is undoubtedly related in part to the water chemistry (Pearsall, 1952; Brook, 1965; Moss, 1973) it has been shown by Bland and Brook (1974) that a factor of overriding importance may be the occurrence and distribution of aquatic macrophytes.

There exist in the English Lake District, especially in upland habitats, a considerable number of small bodies of water known as 'tarns'. Many of these are, at least at certain times, rich in species of desmid. They occur over a range of geological and soil conditions and thus exhibit a range of water chemistry. They also show marked differences in the nature and abundance of their submerged macrophytic vegetation but no comparative study has been made of their desmid floras.

Aquatic habitats are continually changing as sediments accumulate in them. These are formed partly of inorganic silt and partly of organic material derived from the decay of the plants (algae and macrophytes) and animals which live within them. In rocky tarns and pools there is little accumulation of silt and frequently they contain little or no phanerogamic vegetation. Macan (1938), however, found that shallow pools at an altitude of 450 m had either no vegetation or their bottoms might be completely covered by *Sphagnum* and other aquatic mosses. Pools at lower altitudes also contained *Sphagnum* and often in addition *Menyanthes trifoliata*, *Potamogeton natans* and *Juncus bulbosus*. Distinct populations of Corixids were associated with the two main types of pool.

Natural tarns are often of glacial origin, receiving silt from inflowing streams and developing a flora of submerged macrophytes such as *Isoetes lacustris*, *Litorella uniflora* and *Nitella* species. In some there is sufficient development of sediment to support such emergent weeds as *Carex rostrata*, *Juncus bulbosus*, etc. Other tarns, some of which are artificial, having been constructed as fish ponds or reservoirs, often have soil or peat washed into them from surrounding land and these develop a diverse macrophytic flora which includes both emergent and floating leaf types.

A final stage in the evolution of some tarns would seem to be their invasion by *Sphagnum* which can fill the basin to such an extent that it would be better described as a 'moss' than a tarn though, in some, macrophytes still survive.

Macan (1950) found that in the central and southern parts of the Lake District there is a relationship between the rate of accumulation of organic matter in the mud and the distribution and succession of certain species of Corixidae. Smyly (1958) showed that although some species of Copepoda and Cladocera were ubiquitous, there was a strong association between many species and the presence or absence of aquatic weeds. The present study has been undertaken to examine whether the desmids show any comparable relationship in their distribution.

All the waters studied lie in an area of either Borrowdale volcanic rock or Bannisdale Slates and are surrounded by rough fell grassland or moorland. Collections were made from most tarns during the summer months when desmids tend to be abundant. A phytoplankton net was thrown from the shore and drawn in slowly, the operation being repeated twenty times. Except in the rocky tarns it was seldom possible to reach completely open water so that many of the desmids collected were undoubtedly associated with aquatic weeds of the tarn margins.

THE TARNS AND THEIR VEGITATION

There are three fairly distinct types of tarn though, as with all natural entities, there is considerable overlap between them.

1. *Rocky tarns*

These have rocky shores and stony bottoms, some peat cover, and contain only small amounts of submerged weeds. Many are corrie tarns and a few are of artificial origin. They nearly all lie among rocky hills at an altitude of 213 to 610 m and are surrounded by fell grassland in which there is often bracken and heather. Corrie tarns in rock basins have very little macrophytic vegetation; others have firm, stony shores with varying degrees of peat cover and contain a number of macrophytes of which the following are most common:

Carex rostrata	*Juncus bulbosus*
Isoetes lacustris	*Potamogeton polygonifolius*
Litorella uniflora	

Total major ions for these rocky tarns have been measured as follows:

1953/54, average for twenty tarns, 274 microequiv. 1^{-1}, ranging from 136 to 495.
1974/75, average for fourteen tarns, 381 microequiv. 1^{-1}.
1953/54, average for the same fourteen tarns, 283 microequiv. 1^{-1}.
The average increase in calcium in these fourteen tarns was 9 per cent.

2. *Pools*

These are shallow bodies of water of various sizes and shapes, partly stony but with peaty bottoms. They are widely scattered throughout the upland fells and are commonly surrounded by *Sphagnum-Eriophorum* bog. Some of them, especially at high altitudes, have only sparse macrophytic vegetation while others have a fairly abundant macrophytic flora. The commonest species are: *Menyanthes trifoliata; Potamogeton polygonifolius; Juncus bulbosus. Sphagnum* and other mosses may be very abundant.

Few chemical data are available relevant to these pools. In 1953/54 the total ionic content ranged from 158 to 334 microequiv. 1^{-1} but there are no comparative figures for the same pools in 1975. The few waters which were analysed seemed to show an increase in total ions.

3. *Weedy tarns*

These are common throughout the fell country especially at lower altitudes (91–403 m). Some are of glacial origin while others have been made artificially and may serve as fish ponds or small reservoirs. They range from those with firm, often rocky shores and a considerable submerged and emergent macroflora to others which in addition have floating-leaved plants including water lilies. The emergent plants often spread outwards from the bays so that there is little open water left. Depths vary from 1 to 14 m.

A comparison of the occurrence of macrophytes in these tarns as shown by a survey conducted in 1953/54 with a similar survey made in the course of the present study between 1972 and 1975 shows that there has been a considerable invasion by *Sphagnum* so that some of the more highly evolved tarns previously classified as 'weedy' are rapidly becoming bogs and it is difficult to distinguish ecologically between some very weedy tarns and large pools.

It can also be difficult to decide whether a body of water should be classed as a weedy tarn or a small lake. Macan (1950) suggests that tarns containing *Phragmites communis* should be considered as small lakes but in the present study six tarns containing *Phragmites* are treated as weedy tarns.

The following macrophytes commonly occur in the majority of weedy tarns in addition to the reed flora round the edge:

Carex rostrata	*Litorella uniflora*	*Nuphar lutea*
Chara spp.	*Lobelia dortmanna*	*Nymphaea alba*
Equisetum fluviatile	*Juncus bulbosus*	*Potamogeton natans*
Glyceria fluitans	*Myriophyllum alternifolium*	*P. polygonifolius*
Hydrocotyle vulgaris	*Nitella* spp.	*Ranunculus flammula*
Isoetes lacustris		

Total major ions for these tarns have been measured as follows:

1953/54, 352–843 microequiv. 1^{-1}; average for fourteen tarns 507 microequiv. 1^{-1}.

1974/75, average for the same fourteen tarns 710 microequiv. 1^{-1}; the average increase in calcium being 15 per cent.

Distribution of common species
Percentage occurrence

	Weedy (27)	*Rocky* (20)	*Pools* (12)
SACCODERMAE			
Netrium digitus	40	65	100
N. oblongum	20	80	25
Cylindrocystis spp	+	35	20
PLACODERMAE			
Gonatozygon monataenium	25	30	—
Actinotaenium cucurbitinum	—	30	65
Tetmemorus granulatus	30	+	+
Pleurotaenium coronatum	30	—	—
P. ehrenberghii	65	—	+
P. trabecula	30	+	—
Closterium didymoticum	25	+	+
C. dinae	+	—	25
C. intermedium	+	+	25
C. kutzingii	40	+	+
C. lineatum	+	+	30
C. lunula	24	+	+
C. ralfsii var *hybridum*	20	+	25
C. setaceum	+	—	20
C. striolatum	+	25	25
C. ulna	+	—	60
Euastrum affine	+	20	30
E. ansatum	30	45	25
E. bidentatum	35	20	+
E. crassum	+	35	+
E. didelta	—	+	25
E. elegans	40	20	+
E. insigne	+	20	40
E. oblongum	30	—	25
E. pectinatum	+	25	+
E. pulchellum	+	+	
E. verrucosum	55	+	+
Micrasterias americana	+	20	—
M. apiculata	60	25	20
M. denticulata	55	20	25
M. papillifera	30	+	25
M. rotata	+	20	+
M. truncata	25	+	50
Xanthidium antilopeum & vars	80	70	43
X. armatum	+	50	30
X. cristatum	26	—	+

Distribution of common species *(continued)*

	Weedy (27)	*Rocky* (20)	*Pools* (12)
Staurodesmus brevispinus	40	+	+
S. convergens & vars	65	+	25
S. cuspidatus	23	—	—
S. dejectus	24	—	+
S. indentatus	26	50	—
Cosmarium abbreviatum	+	30	+
C. amoenum	+	—	25
C. blyttii	25	+	+
C. botrytis	50	20	+
C. brebissonii	+	—	20
C. connatum	35	—	+
C. contractum	25	—	+
C. depressum & var	26	50	+
C. impressulum	26	—	—
C. margaritatum	40	—	30
C. margaritiferum	45	30	25
C. ovale	+	—	20
C. portianum	35	—	+
C. punctulatum	55	20	20
C. quadratum	30	–	25
C. ralfsii	+	+	25
C. reniforme	60	+	25
C. sportella	30	—	—
C. subcrenatum	40	+	—
C. subtumidum	40	20	60
C. tetraophthalmum	20	—	+
Staurastrum anatinum & vars	33	25	+
S. arctiscon	27	50	—
S. cingulum	20	—	—
S. controversum	+	20	—
S. dilatatum	27	+	25
S. furcigerum & vars	43	20	+
S. hirsutum	+	20	20
S. hystrix	+	—	25
S. longispinum	22	—	—
S. lunatum var *planctonicum*	+	20	—
S. margaritaceum	+	30	43
S. punctilatum	+	—	25
S. teliferum	+	—	25
S. sebaldi var *ornatum* & f. *planctonicum*	20	—	—
S. vestitum	+	20	20
Hyalotheca dissiliens	60	50	70
H. mucosa	37	20	30
Desmidium schwarzii	25	+	+
Bambusina moniliformis	26	+	30

Distribution of Species

The above lists show the distribution of the commoner desmids in tarns of the three types. Only those species which occurred in at least 20 per cent of the tarns of one type are listed.

+ indicates present but in less than 20 per cent of the tarns

– indicates absent

It will be noted that *Staurastrum paradoxum* and *S. gracile* which are commonly listed in earlier works are here omitted following Brook (1959). The former *S. gracile* var *cyathiforme*, the only commonly occurring variety of *S. gracile* is included in *S. cingulum* again following Brook. Included in *S. anatinum* are the varieties *controversum* and *truncatum* and the form *denticulatum*.

The percentage presence of any species may vary considerably throughout the year and the figures given refer to the summer months. Coesel (1975) studied the algal species of 270 bodies of water in the Netherlands ranging from eutrophic to oligotrophic types and, although certain associations could be distinguished, there was considerable overlap. The waters described in this paper would appear to come nearest to his oligotrophic habitat and there is considerable agreement between the species he lists in these waters and those found most frequently in the more oligotrophic Lake District tarns. Peterfi (1975) describes the distribution of desmids in mesotrophic and oligotrophic bogs in Romania. Of the thirty-three species recorded, twenty-one were common in Lake District oligotrophic waters and seven others occurred less commonly.

Summary and Conclusions

A study has been made of the phytoplankton, especially the desmids, of a number of small bodies of water known locally as 'tarns' among the hills of the English Lake District in Cumbria. The tarns are considered under three ecological headings: Rocky Tarns of which twenty are described, Pools (twelve) and Weedy Tarns (twenty-seven). Wherever possible, data are given of major ions in 1953/54 and in 1973/75. This figure is lowest in pools and highest in the weedy tarns and, in most cases, there has been a considerable increase between the dates of the two analyses.

A list is given of those species of desmid which occurred in 20 per cent or more of the tarns of each of the three groups with an indication of their presence or absence in the other groups. There seem to be few species which could be considered as being *confined* to a certain type of tarn, though some formed a noticeably higher proportion in the tarns of a particular category.

I wish to express my thanks to the Freshwater Biological Association for allowing me laboratory space and the use of the library at their Ferry House Laboratory.

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BOOK REVIEWS

Lichens. An Illustrated Guide by **Frank Dobson**. Pp xl + 317 (including many b/w photographs, line drawings and maps), plus 8 pages of colour photographs. Richmond Publishing Co. 1979. £7.95

A morphological description, a photograph, notes on chemical reactions and habitat, a distribution map and an indication of pollution tolerance are provided for about 450 of the 1471 lichen species known to occur in the British Isles. The selection is good, and representative of the commoner species to be encountered over the majority of the country, together with a few rarer conspicuous macrolichens. The general and generic keys are curiously presented in a variety of groupings and tabulations (occasionally illustrated) which are difficult to cross-reference to the text, but the keys within genera are presented in a more practical dichotomous manner.

The main feature of the book is the photography: much of this is of a high standard and will prove most useful to the beginner. However, the quality of a few is disappointing and such plates will have very limited value in species (or indeed generic) determination. The majority of the distribution maps are oversimplified, and many are erroneous.

There are numerous spelling mistakes in the text. Normally one would welcome the presence of an index, but unfortunately this one is so full of errors (spelling, sequence, repetition, omission, and inaccurate cross-referencing) that it is a hindrance rather than a help.

Despite these misgivings, this is a useful addition to lichen identification guides for use in the field (the book is well bound in a water-resistant cover) and in the laboratory. It will prove particularly valuable as an introduction to lichenology (especially on field courses) and for the non-specialist natural historian.

MRDS

Introduction to Fungi by **John Webster**. Pp. xii + 669, including 331 line drawings and b/w photographs. Cambridge University Press. 2nd edition. 1980. £30 hardback, £9.95 paperback

Extensive revision of a standard textbook (1st edition 1970), which deals mainly with the structure and reproduction of each of the major groups of the Myxomycota and Eumycota, including a new section on the Fungi Imperfecti (55 pages). More than 90 new illustrations have been incorporated and the bibliography contains about 1770 references as compared with about 900 in the previous edition, which gives a measure of the considerable advancement of knowledge over the past ten years.

The clearly written text covers fungi readily available in the natural state, drawing attention to their economic and ecological importance as well as their mode of life. Original photographs and drawings prepared from fresh material have been thoughtfully used to complement this authoritative account.

This book is thoroughly recommended to students and teachers not only as a fundamental text but also as an invaluable reference guide to mycological literature.

A Perspective of Environmental Pollution by **M. W. Holdgate**. Pp x + 278, including 59 figures and 31 tables. Cambridge University Press. 1979. £15 hardback, £5.95 paperback

This book by a leading British ecologist describes how the various components of the environment have been influenced by man, and under what circumstances a pollutant may arise. Particular attention is paid to the pathways which pollutants follow in air and water, and the main changes brought about thereby in these ecosystems. The consequent effects on man, other animals and plants are related to pollutant concentrations, and environmental monitoring for pollution control is discussed. The evaluation of damage and benefits, the regulation of pollution, and the national and international implications are some of the many topics covered in this important review. The text is supported by numeric, graphical and flow-chart data and a useful bibliography (in which several errors have unfortunately been detected).

THE IDENTIFICATION OF THE BISEXUAL FORM OF THE BRISTLY MILLIPEDE, *POLYXENUS LAGURUS* (L., 1758) (DIPLOPODA: POLYXENIDA) AT THREE COASTAL SITES IN ENGLAND AND WALES, USING SEX RATIOS

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Polyxenus lagurus, the sole British representative of the myriapod sub-class Pselaphognatha (Penicillata), characterized by a lack of calcium in the cuticle, the absence of gonopods and the presence of variously serrated hollow spines (Blower, 1958), is locally common in Great Britain. It has been recorded from twenty vice-counties in England, and from Pembrokeshire and Denbighshire in Wales (Blower, 1972).

Development in *P. lagurus* is anamorphic, and progresses through a number of stadia at which segments and legs are added (see Table 1) until an adult stage is reached (stadium 8). This is followed by a number of epimorphic stadia where no further segments or legs are added (Blower, 1958). The sexes first become apparent in stadium 6, though it is not until stadium 7 (sub-adult) when the sexes can be identified with certainty (Meidell, 1970). The sexes are recognized by the shape of a pair of processes between and slightly posterior to the second coxae on the ventral side (Schömann, 1956). The female vulvae appear as truncated cones, whereas the male penes are relatively longer than the vulvae and are not truncated (Fig 1). We have found it necessary to redraw Schömann's figure of the penes since we feel he shows the penis as being more curvilinear than it really is.

P. lagurus is notable for having a bisexual and a parthenogenetic form and, because the bisexual form is thought to have a 1:1 sex ratio whereas the parthenogen has no males, populations of such forms can be identified using sex ratio analysis of a large sample (Enghoff, 1976a). Enghoff (1978), on the basis of observed sex ratios, has documented the distribution of both forms in Europe, but as no sex ratios of any British samples have ever been published (J. G. Blower, pers comm) the identity of British *Polyxenus* has never been determined.

We have taken reasonably large samples of *P. lagurus* from Graig Wen, Anglesey (23/399 947), 4.5 km WNW of Amlwch, altitude 70 m, on 30.III.80; from Saltwick Nab, N Yorkshire (45/914 113), 2 km SE of Whitby, altitude 10 m, on 3.IV.80; and from Nant Bay, Bardsey Island (23/122 225), altitude less than 3 m, on 4.VIII.80. The first sample, which is a new record for Anglesey, was taken from the soil and stone fragments between the crevices of a shale wall on a south-facing slope. The Saltwick sample, which confirms an earlier record for this site (Jackson, 1919), was taken from amongst soil and shale fragments on a headland formed by an alum shale outcrop. The Bardsey sample, which is a new record for Caernarvonshire, was collected from a population observed and identified by Drs S. L. Sutton and R. G. Loxton (pers comms), was taken from shell sand amongst isolated clumps of sea thrift (*Armeria maritima* Willd.) on exposed rough rock lying within the supralittoral fringe. The frequency of individuals in various stadia collected at Saltwick and Bardsey is given in Table 1.

The sex ratio of adults and sub-adults in the three samples is given in Table 2, and is expressed as proportion of males in Table 3. None of these ratios deviates significantly from the 1:1 sex ratio we would expect of pure bisexual populations. Nevertheless, the sex ratios at Saltwick for adults, and for adults and sub-adults combined, approached the 95 per cent level of statistical significance when tested against a 1:1 ratio using Chi^2 analysis ($0.1 > p > .05$), so it is possible that the Saltwick sample represents a population composed of both the bisexual and parthenogenetic forms. Such aggregates of bisexuals and parthenogens are known in the woodlouse *Trichoniscus pusillus* (Fussey and Sutton, 1980). It may well be, however, that this deviation from a sex ratio of unity at Saltwick is purely the result of differential mortality between the sexes, since the proportion of the males drops markedly from sub-adult to adult (Table 3). Such lower male survival has been described previously

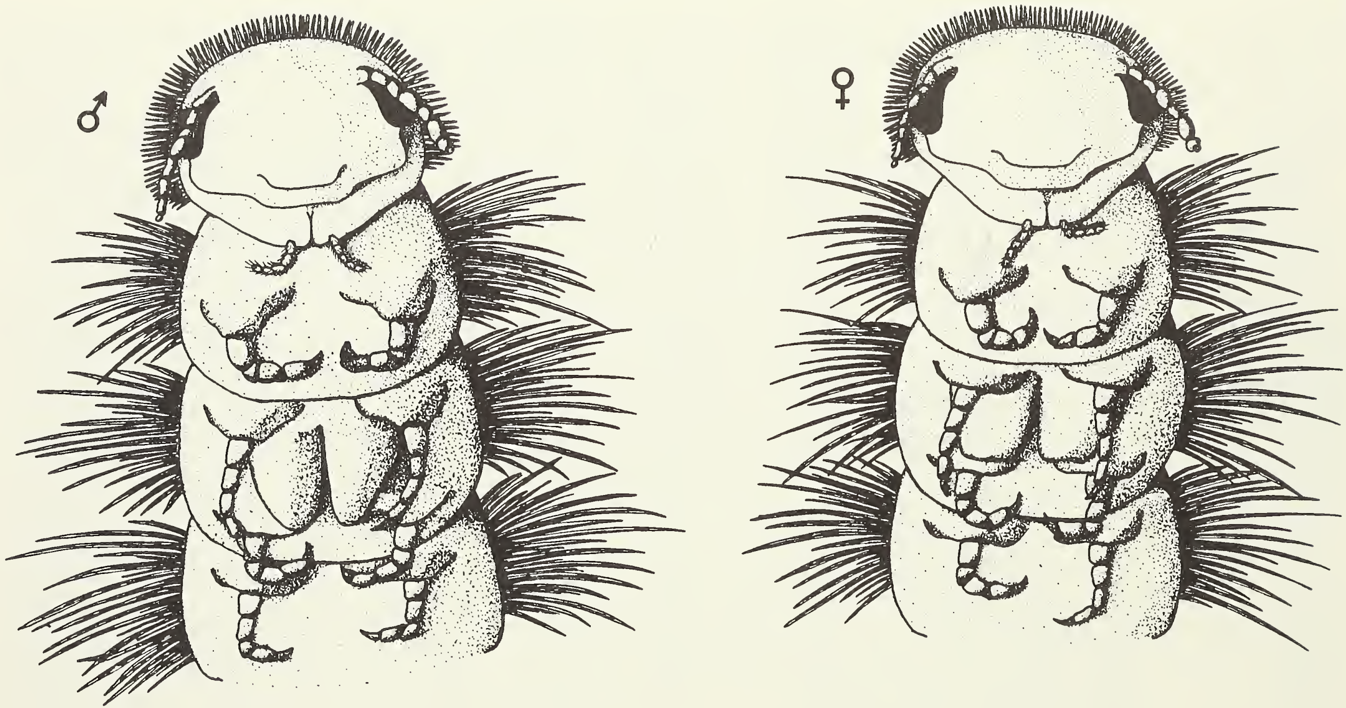

FIGURE 1
Diagrammatic representation of male and female *Polyxenus lagurus*, to show the position and shape of the reproductive organs directly posterior to the second pair of coxae

from the bisexual form of another millipede species which is known to have a parthenogenetic form, *Nemasoma varicorne* C. L. Koch (Enghoff, 1976b).

The only other British sample for which the sex ratio is available, that we are aware of, is from Kent. In this population males and females were equally represented (J. G. Blower, pers comm). Thus it seems that the four British samples examined to date are largely, if not totally, bisexual.

TABLE 1

Number of body segments and legs present in the stadia of *P. lagurus* together with the frequency of stadia in samples from Saltwick Nab and Bardsey Island

Stadium	*Number of body segments*	*Number of legs*	*Frequency at Saltwick*	*Frequency at Bardsey*
I	5	3	0	7
II	5	4	0	0
III	6	5	5	2
IV	7	6	6	19
V	8	8	0	34
VI	9	10	11	7
VII	10	12	21	17
Adult	11	13	19	33

TABLE 2

Sex ratio in adult and sub-adult stadia at three sample sites

Stadium and Sex		*Saltwick*	*Bardsey*	*Anglesey*
VII	♂	8	6	2
VII	♀	12	11	3
Adult	♂	3	15	5
Adult	♀	16	18	5
Combined stadia	♂	11	21	7
Combined stadia	♀	28	29	8

TABLE 3

Proportion of males in adult and sub-adult stadia for three sample sites

Stadium and Sex	*Saltwick*	*Bardsey*	*Anglesey*
VII	.400	.353	.400
Adult	.158	.455	.500
Total	.282	.420	.467

ACKNOWLEDGEMENTS

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FIELD NOTE

Black duck at Fairburn Ings: first Yorkshire record

At about 14.45 hrs on 20 December 1978 a Black duck *(Anas rubripes)* was picked out from amongst a flock of some 200 dabbling ducks, chiefly Mallard *(Anas platyrhynchos)*, which were on the ice at the RSPB reserve at Fairburn Ings, North Yorkshire. It was watched for about an hour through binoculars and a telescope at a range of some 100 metres by Miss P. S. Allen and myself. For the next few days observations were hampered by fog and the bird was never seen again.

The following description was taken from our notes: *Size and shape:* Basically as accompanying Mallard but rather larger and heavier-bodied although this effect could have been due to the darkness of plumage making the bird appear larger. *Bill:* Shape and structure as bill of Mallard; dull pale grey-green in colour with a black nail. *Legs and feet:* Orange-red, rather browner than those of Mallard. *Plumage:* Body and wings very dark dusky-brown with browner feather fringes, these fringes narrow and inconspicuous and most marked on mantle and scapulars. Tail dark brown with even darker upper and under tail coverts. Wings dark over all, speculum colour not definable but dark with very narrow white trailing edge (much narrower than white trailing edge of Mallard) and no white band along base of speculum which is present in Mallard. Paler grey-brown sides of head and neck and superciliary contrasted with dark crown, nape and line through eye.

This record has been accepted by the *British Birds* Rarities Committee and constitutes the seventh record for Great Britain and Ireland of this Nearctic relative of the Mallard. It is also the first inland record and the first for Yorkshire and northern Britain of a species which breeds in north-eastern North America, wintering south down the Atlantic seaboard to the Gulf of Mexico.

S. C. Madge

BOOK REVIEW

Flora Europaea: Vol. 5, Alismataceae to Orchidaceae (Monocotyledones) edited by **T. G. Tutin, V. H. Heywood, N. A. Burges, D. M. Moore, D. H. Valentine, S. M. Walters,** and **D. A. Webb**. Pp xxxvi + 452, with 5 maps. Cambridge University Press, 1980. £37.50

The appearance of the fifth and final volume of *Flora Europaea* fifteen years and five months after the publication of volume one, brings to an end one of the great undertakings in systematic botany. The editors themselves were not fully aware of the daunting magnitude of the task on which they had embarked since the time required for its completion has been nearly double that which had been envisaged and five volumes instead of the four originally planned have been needed. Despite the many formidable problems affecting its organization and execution, progress has been maintained with unflagging determination and so carefully was the work planned at the outset that no modifications in the manner of presentation became necessary as it proceeded.

The five volumes contain descriptions of 11,557 species and between 2350–2400 subspecies. One of the editors has recently published some interesting statistics extracted from the completed work. From these we learn that, excluding the apomictic genera, about 10,500 of the species included in the flora are natives with 3500 endemic to Europe. About 2750 books and periodicals in many different languages are cited as sources of descriptions and approximately the same number of authors is listed in an appendix giving the abbreviated form of their names and dates of birth and death. The countries with the largest floras are Spain, Yugoslavia and Italy with between 4750–4900 species; Britain with 1700–1850 native species comes twenty-fifth in the table of size of flora per country, well below Switzerland with 2600–2750 and Albania with 3000–3300. Nearly half the Flora has been written by the seven British members of the editorial committee and although regional advisers representing every European country have been consulted throughout, nearly three-quarters has been written by British authors. The total number of contributing authors is 187.

This volume covers all the families of Monocotyledons. None of the genera in these families has produced the very large number of apomicts which have complicated the treatment of some genera, especially in the Rosaceae and Compositae, in earlier volumes. At the same time the sedges and grasses provide the second and third largest genera of European flowering plants, *Carex* having 180 and *Festuca* 170 species. *Allium* has 110 species but of the other genera covered only *Juncus* with 53 has more than 50 species whilst *Poa* and *Crocus* have 49 and 43 respectively.

The accounts of the rushes and grasses introduce many changes in the currently accepted lists of British species. *Juncus alpinus* Vill. replaces *J. alpino-articulatus* Chaix; *J. nodulosus* Wahl. disappears as a British species and *J. marshallii* Pugsl. is sunk without trace even in synonymy. *J. bulbosus* L. is not subdivided but the *J. bufonius* group consists of six species four of which, *J. foliosus* Desf., *J. minutulus* Alb. and Jah., *J. ranarius* Song. and Perr. and *J. bufonius* L. *sensu stricto* are recorded as British. A recent paper (in *Watsonia* **12**: 113–28 (1978)) dealing with the *J. bufonius* aggregate in Western Europe recognized five species with three in Britain, only *J. bufonius s.s.* and *J. foliosus* agreeing with the names employed in this work.

Amongst the grasses generic boundaries have always been less well marked than in most families and hence successive accounts have been prone to deviate at various places from pre-existing ones. Those who fondly supposed that Hubbard's expertise had introduced stability in the names of British grasses may be dismayed by the number of nomenclatural changes introduced in this work. At the generic level *Catapodium* becomes *Desmazeria*, *Danthonia* replaces *Sieglingia*, *Avenula* replaces *Helictotrichon*, *Nardurus* is merged in *Vulpia* and all our *Agropyrons* are transferred to *Elymus*. At the specific level the familiar *Koeleria cristata* (L.) Pers. is replaced by *K. macrantha* (Ledeb.) Schultes and a third British species *K. glauca* (Schrad.) DC. is added. The British *Sesleria* is now separated specifically from *S. caerulea* (L.) Ard. as *S. albicans* Kit. ex Schultes which is one of those unfortunate cases where correct systematics necessitates the rejection of an appropriate, if incorrect, trivial name and the substitution of a descriptively inept one in its place. Thirteen species of of *Festuca* are credited to Britain and these include *F. guestfalica* Boenn. ex Reich., *F.*

lemanii Bast. and *F. nigrescens* Lam. at least some of which appear to be old friends dressed in new clothes. Some name changes are probably not permanent; they are a reflection of taxonomic judgements within groups wherein the delimitation of taxa is a matter of personal opinion. As we have seen in some earlier accounts, given time, the wheel of change sometimes turns full circle.

By contrast with the rushes and grasses, there are relatively few changes affecting British species amongst the sedges and orchids. The fragmentation of *Scirpus* into six different genera as favoured by Clapham, Tutin and Warburg is rejected, just as the grasses *Zerna*, *Anisantha* and *Ceratochloa* are reabsorbed into *Bromus*. Within *Carex* there is scarcely any change and there are few innovations amongst the orchids. The difficult genus *Dactylorhiza* in which variation and hybridization are both very prevalent, is limited to thirteen species with *D. incarnata* (L.) Soó, *D. majalis* (Reich.) Hunt & Summerh. and *D. traunsteineri* (Saut.) Soó as the three species of British marsh orchids, *D. praetermissa*, *D. purpurella* and *D. occidentalis* being treated as subspecies within *D. majalis*. Some will feel that if these are downgraded to subspecies, it would have been more consistent to accord a similar treatment to the spotted orchids instead of *D. maculata* (L.) Soó and *D. fuchsii* (Druce) Soó being given full specific rank; and few if any British botanists will agree that Pugsley's *Orchis pardalina* is synonymous with *Dactylorhiza purpurella* as here given.

Like most monumental and prestigious works *Flora Europaea* will tend to generate around itself an aura of authority beyond that which its authors would claim for it. It would be quite impossible in a work of this kind to maintain a uniformly high degree of taxonomic excellence throughout. Some difficult genera have been written up by experts with long experience of the special problems posed by their groups; others have had to be done without such advantages and in too limited a time for the authors to gain the full knowledge required to cope with the complexities involved. They are therefore no more than provisional. Even when apomictic genera are excluded it is still doubtfully possible to maintain uniform standards of admissibility to the species and subspecies categories. The subspecies which figure so abundantly in these generic treatments are a very mixed lot; some combine morphological differences with distinctive geographical ranges but others are little more than dubiously valid taxa reprieved by demotion from outright taxonomic liquidation.

A work with the scope and range of this one cannot hope to be free from error or immune from criticism. Those who have repeatedly used the earlier volumes will, despite all the editorial care lavished on their preparation, have discovered errors in descriptions and places where keys are unworkable. Yet the merits of these volumes so immeasurably outweigh their shortcomings that it seems churlish to carp. The taxonomic treatment of many difficult groups of plants cannot be resolved within national boundaries and one of the virtues of *Flora Europaea* lies in the adjustment of taxonomic perspectives resulting from a continental as opposed to a narrow regional or national outlook. Its acceptance as the standard Continental Flora will promote a more unified and stabilized framework of names throughout European countries and it will also surely stimulate research in critical groups of species. Progress in the understanding of difficult groups of plants is usually a co-operative process in which many botanists, often from more than one country and over many years, contribute to the disentangling of the problems and complexities involved. In arriving at a generally accepted scheme many proposed species are eventually rejected and hence an accumulation of redundant species is linked with advance in knowledge. One of the most useful achievements of *Flora Europaea* is the way in which it has helped to clean the Augean stables of superfluous names by relegating to synonymy huge numbers of names which have received unjustified recognition.

The successful completion of *Flora Europaea* must have been a matter of very great satisfaction to its originators and editors. The availability of the completed work is certainly a matter of very great satisfaction also to systematic botanists in general and not only to those in Europe. All who have had a hand in the preparation and production of this impressive work deserve unqualified congratulations and thanks.

WAS

JOHN BARTON: A BIOGRAPHICAL SUPPLEMENT

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In introducing the three letters to John Barton recently published in this journal, Shaw (1978) did not establish the identity of this mid-Victorian botanist. This was a useful opportunity missed, for Barton is one of those minor figures ignored by the standard works of reference who nevertheless possess some interest today through the position they occupied in one of those family networks that were such a feature of eighteenth- and nineteenth-century natural history. Some of these figures, moreover, achieved distinction in other fields and may be candidates for future biographies. Barton himself, indeed, became well known for missionary work in India — in which guise he rates an entry in the *Dictionary of National Biography*. On this the account that follows is partly based.

Descended on his father's side from Quaker manufacturers in Cumberland, Barton was born in 1836 at East Leigh, near Havant (not, as the DNB has it, Eastleigh, which was not then yet named), the sixth child of John Barton (1798–1852) and Frances, daughter of James Rickman. Bernard Barton (1784–1849), the poet and friend of Charles Lamb, was an uncle.

His mother having died when he was four, the children were brought up by her only sister, Josephina Christiana Rickman (1808–1892). Both she and his father were keen botanists, achieving contemporary note as the joint rediscoverers of *Ludwigia palustris* (L.)Ell. in Goodyer's original locality, Petersfield Heath, in 1827 (Cooper, 1834; Barton, 1857). It is the father who is the John Barton included by Desmond (1977) on the strength of his authorship that same year of *A lecture on the geography of plants*.

On moving to Stoughton, near Chichester the family had for a neighbour the Rev Gerard Edwards Smith (1804–1881), one of the ablest field botanists of the day, who became a particularly close and valued friend. A letter of Miss Rickman's bearing witness to this as early as 1839 has recently appeared in these pages (Allen and Lousley, 1979). The two letters of Smith's to the younger Barton, reproduced by Shaw (1978), provide further evidence, as does the fact that in his will Smith selected the younger Barton as one of his literary executors. Religious sympathies probably reinforced the botanical affinity, for Miss Rickman's will is redolent of a fervent piety which must have chimed well with Smith's own Evangelicalism.

With such a set of mentors it is no surprise that the younger Barton's interest in botany ripened early. The letters from Smith suggest that this was well developed by the time he went up to Cambridge at nineteen, and by twenty-one his herbarium had been extended to nearly 1000 species (Barton, 1857) — though what ultimately became of it is, alas, unknown (Kent, 1958). In June 1858 he joined the Thirsk Botanical Exchange Club, which was carrying on the annual distributions of the lately ill-fated Botanical Society of London, and the pages of Irvine's *Phytologist* bear copious witness to his intense activity at this period. So intense was this by then, indeed, that after taking his degree in January 1859 he was allowed to return to Cambridge to sit for the Natural Sciences Tripos. There is a letter from him in the Babington correspondence at the Botany School, Cambridge, written from Torquay on 26 January 1860, in which he intimates that he hopes 'to be able to do something in geology and botany, with a little chemistry' and seeks Babington's advice on the books to read on these subjects. September of that year, however, saw him ordained and a month after that he set sail for India.

How far his interests in botany (and geology) stayed with him in later years — he lived till 1908 — is not known. What is known, however, is that a fondness for natural history persisted within the family for at least one generation further. Smith's allusion to the botanical abilities of two of his sisters (Shaw, 1978) and a published note of a rarity found at Brighton by his brother Gerard (Barton, 1859) suggest that John had not been the only one of the children to succumb. Gerard, like him, subsequently entered the Church, settling in

Norfolk at Wymondham; and it was a son of his, Capt Francis Rickman Barton (1865–1947), who gained sufficient reputation as an ornithologist and botanist while a colonial administrator to be accorded an entry in *Flora Malesiana* — as well as in *Who's Who*. Plant collections of his are at Brisbane and in the British Museum (Natural History). It may well be that other descendants are carrying on the tradition still.

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FIELD NOTES

Bryological excursion at Denholme

The spring excursion of the YNU Bryological Section was held in the Denholme area west of Bradford (VC 63) on 26 April 1980.

At Hewenden Viaduct, the stream was found to be badly polluted and only the commonest species occurred. Boggy ground by the viaduct was slightly better, with *Plagiomnium elatum*, a very local species in VC 63. *Pohlia wahlenbergii* was on a wet track. Further wet areas were examined at and above Doe Park Reservoir. A *Plagiothecium* was found which in the field seemed close to *P. ruthei*, but from leaf shape was eventually referred to *P. denticulatum*. *Calliergon stramineum* and *C. cordifolium* were present in some quantity, and excellent material of *Pohlia camptotrachela* was found on wet peaty soil. A wall at the upper end of the Reservoir proved interesting: *Drepanocladus uncinatus*, rare in S Yorkshire, was present in small quantity, with *Brachythecium populeum*, stunted *Racomitrium heterostichum*, and others. Also known to occur in the valley are *Nardia geoscyphus* and *Ditrichum cylindricum*, but in the prevailing dry weather it was not expected that these would be refound.

The district is typical of many in S Yorkshire, made inhospitable for bryophytes by heavy atmospheric pollution and with few redeeming topographical features; nevertheless, some sixty-five species were recorded.

T. L. Blockeel

Sphagnum balticum refound on Thorne Moors

The bryophytes of Thorne Moors near Doncaster were reported by Miss Dalby (*Naturalist* 1970: 139–40) after the YNU Meeting of June that year. Although she listed ten species of *Sphagnum*, these did not include *S. balticum*, which had been collected here by A. Thompson and was confirmed by Dalby in her review of the Yorkshire Sphagna (*Naturalist* 1965: 73–80). Thompson's specimen (BM) was collected in 1932. *S. balticum* is one of the scarcest of the British *Sphagnum* species and is known from only six vice-counties.

I had this record in mind when I visited Thorne Moors in January 1980 under the guidance of Mr B. Eversham. The prospect of refinding the species seemed slim and field observation was rendered difficult by the icy conditions. However, the material gathered was subsequently found to contain several stems which resembled *S. balticum* in their brown coloration and three-branched fascicles. Mr M. O. Hill has confirmed that the plant is indeed typical *S. balticum*. The habitat is at the centre of the moor in one of the old canals

which are undergoing recolonization. The following species were growing along the same stretch of canal: *S. papillosum*, *S. squarrosum*, *S. recurvum* var. *mucronatum*, *S. cuspidatum*, *S. fimbriatum*, *S. capillifolium*, and *S. subnitens.*

S. balticum is much the most noteworthy bryophyte of Thorne Moors, the remaining species recorded being widespread and characteristic of wet peat. There is only one other record of *S. balticum* in Yorkshire (Lawkland Moss, A. Thompson, 1940), but Miss Dalby was unable to trace a voucher and the record stands in need of confirmation.

T. L. Blockeel

Possible display-call of Jack Snipe in the Thorne area

In the morning (alone) and evening (with C. Wall) of 23 March 1976, I flushed a Jack Snipe *Lymnocryptes minimus* from a marshy area adjacent to the New Junction Canal, close to Smallhedge Farm. On each occasion the snipe flew off eastwards. After it had been flushed in the evening, a sound was heard from the direction of nearby Clay Bridge (just to the east of the canal). At first this was assumed to be a horse cantering along a surfaced road, giving two 'hoofbeats' per second. However, the sound, which was both regular and sustained, apparently emanated from only one point. It soon became evident that we were not listening to a horse, and the likelihood of a bird call was then considered. Unfortunately we were on the wrong side of the canal to follow up this possibility in the daylight available.

Although no conclusions can be drawn, it seems worth noting that the display-call of Jack Snipe has often been likened to the sound of equine hoofbeats. For example Ralph Chislett (*Northward Ho! — For Birds,* 1933) when describing this call, commented: 'Quite aptly it has been compared with the sound of a horse galloping in the distance over a hard, hollow ground'. The *Handbook of British Birds* (Witherby, H. F. *et al*, 1941) confirms that the note is delivered on the ground as well as in the air.

Martin Limbert

***Trichoniscoides albidus* (Budde Lund, 1879), an isopod new to Yorkshire**

A single specimen of the woodlouse, *Trichoniscoides albidus*, which until its recent recording from Bedfordshire, Surrey, North Essex, Berkshire, and Notts, was considered to be a rare species (A. J. Rundle, *pers comm*), was taken during a hand search in calcareous soil on the grass-covered banks of Thorngumbald Drain, Holderness, East Yorkshire (VC 61; TA(54) 186257) on 6 April 1979. This drain runs through an area of arable land. This record, taken together with previous records, confirms the notion (Rundle, 1979 in *British Isopod Study Group Newsletter* **12**: 5) that the soil of stream banks is a preferred habitat for this species.

This species resembles, but is generally slightly larger than, the common *Trichoniscus pusillus* and can be distinguished by having a tuberculate dorsal surface and a single ocellus (*T. pusillus* has three). In addition, *T. albidus* loses its marbled reddish brown colour in alcohol which *T. pusillus* does not.

Though two Yorkshire records (VC 62 and 63) for this species are given in Rhodes (*Naturalist*, 1916: 99–102), neither of them can now be substantiated. On this criterion neither of them figured in the latest British Isopoda Study Group *Atlas* (Harding, 1976), and so the present record is, in effect, the first Yorkshire record. It seems likely that it may prove quite common if specifically searched for in the appropriate habitat. I would like to thank Dr A. Rundle for supplying voucher specimens to enable me to confirm my identification.

G. D. Fussey

Some interesting insects at Tag Lock, Elland

In July 1979 Mr J. H. Flint discovered the very local weevil *Gymnetron antirrhini* Pk., in some numbers, on Toadflax (*Linaria vulgaris* Mill.) at Sheepscar, Leeds. The district is one of the inner city areas recently cleared of derelict housing prior to redevelopment, and the Toadflax was growing along the edge of the resultant waste land. Mr Flint kindly gave me precise directions from which I was able to locate the site and I had no difficulty in obtaining a short series of the beetle, which was still abundant two or three weeks after the original discovery, the insects occurring chiefly within the corollas of the flowers.

Recalling that when I lived in Halifax over twenty years ago, I used to see Toadflax in the

vicinity of Tag Lock, I resolved to visit the area when a suitable opportunity arose in order to search for the beetle there. Tag Lock is a very old canal situated in the Calder Valley mid-way between Elland and Brighouse. It has long been disused and in former times it was a favourite haunt of Halifax naturalists, especially those interested in pond life and microscopy. Like other interesting habitats in that part of the valley, it has undergone considerable change during the past twenty or thirty years. An electricity power station has been built on the site of the nearby sewage farm which was once a mecca for local bird watchers, and three large gravel pits have been dug in bends of the river. One of these received ash sludge from the power station, another is used for water sports and the third, now filled in but not yet restored to agricultural use, abuts Tag Lock, the spoil heaps from the original excavations having destroyed much of the old canal.

I was eventually able to pay a brief visit to the area on 11 August 1979 when I spent about an hour looking for the beetle. The masses of Toadflax I remembered seeing years ago had disappeared, but finally I located about a dozen plants and to my delight found that they, too, had good numbers of *Gymnetron antirrhini* on them.

It was pleasing to find other interesting insects during my search, for at first sight the whole area has a devastated look and superficial impressions are that nothing of entomological value can have survived all the disturbance that has taken place. This, however, is not so, and the following notes demonstrate that even the least auspicious looking area may hold unsuspected treasures.

Sweeping the vegetation growing in the narrow strip between the cinder path and the retaining wall of the River Calder, where the high railway embankment wall comes closest to the river, I was pleased to take a couple of specimens of the local mirid bug *Mecomma dispar* (Boh.) which I think came off Wood Sage (*Teucrium scorodonia* L.). This is a distinctive insect which I have taken on two previous occasions, these being on the sea cliffs at Sandsend, and the edge of the colliery tip at Moorends. There are only four other records of the species in Yorkshire, these being Spurn, Robin Hood's Bay, Askham Bog, and Wharnecliffe. A second interesting mirid bug, *Plagiognathus albipennis* (Fall.), was taken on *Artemisia*, which is the host plant. Again, there are few Yorkshire records for this species, although it is almost certain to be found wherever Mugwort or Wormwood occur. However, being usually plants of waste places they often escape the attention of entomologists!

On a dry grass bank near the railway I took a single specimen of the very handsome hover fly *Chrysotoxum bicinctum* (L.). Although not rare, this distinctive fly has eluded me in the past, and prior to 1979 I had only taken it on two occasions in twenty years, once at Houghton Wood near Market Weighton, and then in Anglesey. But in 1979 I took single specimens at Tag Lock, Bishop Wood and Ashberry Pastures.

Although, as indicated earlier, much of Tag Lock itself has been destroyed there are still some interesting small pools which remain and I was pleased to see the hover fly *Pyrophaena granditarsa* Forster, and, more unexpectedly, a single specimen of *Platycheirus fulviventris* (Macq.). In my experience this latter hover fly is by no means common and I have only previously encountered it in low lying marshy areas such as Goole Moors and Blacktoft Sands. The last insect of note was the conopid fly *Conops quadrifasciata* Deg., which, although not uncommon, I have personally seen on only three previous occasions in Yorkshire.

Roy Crossley

Some interesting spider (Araneae) records

Pirata uliginosus (Thorell) (64) Austwick Moss, an adult female accompanied by numerous immatures, in *Hypnum* moss under *Myrica*, 29/4/78. Malham area in 1975 was first record VC 64. Tolerates drier places than other *Pirata* species. Not found in Britain until 1951, but previously probably overlooked.

**Tegenaria agrestis* (Walck) (62) Coatham Dunes, under slag on tips with short vegetation, adults on 19/8, 2/9, 28/10/78 (NZ5725, 5527, 5626). Other Yorks records are three from the Doncaster area. This large outdoor relative of the common house-spider (*T. domesticus*) was first found in Britain in Hants during 1949, and since then has expanded its known range to many parts of England and to Wales and Scotland.

**Walckenaera incisa* (OP-C) (62) Kilton Woods, one adult male in a pitfall trap, in a clearing near to Kilton Beck, 12/11/78 (NZ7017). Other records from Yorks are Cottingham near Hull in 1915 and Rotherham in 1978.

Silometopus incurvatus (OP-C) (62) Coatham Dunes and in the dunes on the cliffs near Marske. la Touche recorded it from 'Redcar' in 1946 and 1947 but most probably he collected it from Coatham Dunes. I also found it across the Tees at Seaton Dunes (*66). I found it to be confined to the narrow strip of fore-dune dominated by *Ammophila arenaria* and *Elymus arenarius*, where it was one of the more abundant spiders in litter. Adult males and females were taken throughout 1978.

**Taranucnus setosus* (OP-C) (64) Austwick Moss, an adult female in *Phragmites* litter, 28/8/77. Other Yorks records Askham Bog, Skipwith Common, Tilmire near York and recently Grimstone Moor (62).

**Lepthyphantes pinicola* Simon (64) Grassington Moor, two adult females under stones on the short grassland covering old mine tips, 17/10/78 (SE0266, alt 360 m). Apparently the only other Yorks record is of a single female taken by Lodhi in a pitfall trap under *Pinus nigra* in the Dalby Forest near Scarborough (SE9694, alt 215 m) during 1975 (62).

I am grateful to Clifford J. Smith who supplied me with the information on past records.

D. Horsfield

* Probable new vice-county records are indicated thus

The occurrence of Catoptria falsells (D & S) in Yorkshire during 1979

In November 1979 I received from Mr P. Q. Winter the microepidopterous content of a Rothamsted light-trap operated at North Moor, Wykeham (VC 62) during 1979 and in January 1980 Mr T. Potter gave me smaller samples of microlepidoptera collected on five dates between 19 July and 18 August 1979 in a Rothamsted light-trap at Howefield Farm, Baldersby, near Thirsk (VC 64).

The Wykeham batch for the period 16–31 July contained two specimens of *C. falsella*, while in the Baldersby samples it was represented on all five dates with a total of twenty-eight moths in all. Indeed in the batch dated 19 July the twelve *C. falsella* present made it the most numerous species in that sample.

These records are remarkable in that there is only one previous Yorkshire occurrence, a single specimen netted at dusk in early July 1906 at Saxton, near Tadcaster (VC 64) by T. A. Lofthouse (*Naturalist* 1907: 188).

Harry E. Beaumont

THE MOSS *OCTODICERAS* IN LEEDS, NEW TO YORKSHIRE

T. L. BLOCKEEL

A moss has been added to the Yorkshire flora in the unlikely setting of industrial Leeds. *Octodiceras fontanum* (La Pyl.) Lindb. is an aquatic moss close to the genus *Fissidens*, but distinctive in its relatively large size, flaccid habit and long narrow leaves. It grows as blackish tufts or patches (2–3 cm long) submerged on wood and stone at the edge of the Leeds and Liverpool Canal. Since the original discovery near Armley Mills, I have searched the canal banks from the terminus near Leeds City Station as far as Armley Mills (with the help of Mr A. Norris), and also in the Gotts Park, Bramley Fall and Calverley areas. Only one additional site has resulted. Details of the occurences are:

1. Stonework at edge of canal, under Canal Road Bridge, near Armley Mills (north bank, VC 64), in quantity but only for a few yards under the shade of the bridge, April 1980.
2. Stones and wood at edge of canal immediately above and below Spring Gardens Lock, in shade of tall buildings (south bank, VC 63), a few small tufts, May 1980.

The one associated bryophyte is *Fontinalis antipyretica* Hedw., which occurs constantly

along the canal banks. *Fissidens crassipes* Wils. was the only other aquatic species seen during the survey for *Octodiceras*, though a number of other species grow near but above the water level. The water of the canal is relatively clean and supports a rich molluscan and fish fauna. *Octodiceras* in any case is known to tolerate some pollution (cf Smith, 1963). It is distributed chiefly in central and southern England and is characteristic of canals and sluggish streams. Both the Leeds sites suggest a need for some shade, as previously reported by Sowter (1972) for the species in Leicester and Northampton. Another limiting factor in its distribution may be the thick algal growth along the greater part of the canal banks. The leaves themselves of *Octodiceras* are obscured by a thick coating of epiphytic algae.

In the North of England the species is known from Cheshire and there is one record from Lancashire, by Wilson in 1912, in an overflow channel of the Manchester and Ashton-under-Lyne Canal (Savidge *et al*, 1963, p 134). The distribution map of Smith (1963) is now rather out of date. The new sites are the northernmost British localities for the plant. It is likely to turn up elsewhere in the Leeds and Liverpool and perhaps other canals in the county.

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Smith, A. J. E. (1963) Distribution maps of bryophytes in Britain: *Octodiceras fontanum* (La Pyl.) Lindb. *Trans Brit bryol Soc* **4**: 522.

Sowter, F. A. (1972) *Octodiceras fontanum* (La Pyl.) Lindb. epiphytic on sponges. *J Bryol* **7**: 87.

BOOK REVIEWS

Richard Heaton of Ballyskenagh 1601–1666 by **Laurence Walsh**, O. Cist. Pp 116, with 12 plates. Parkmore Press, Roscrea. 1978. £6 hardback limited issue; £2 paperback

Richard Heaton has been called the 'First Irish Botanist' – a claim which surely can be contested in several ways, not least because he was born in Hooton Pagnell, near Doncaster, Yorkshire, in 1601! Heaton studied at St John's College, Cambridge, was ordained as an Anglican priest and became chaplain to Lord Wentworth's Lifeguard of Horse, accompanying them to Ireland *c*. July 1633. By late August 1633, Heaton was appointed Rector of Birr, Co Offaly. He does not seem to have taken up residence in Birr immediately, but by 1640 he had moved to the Birr area. In 1641, rebellion broke out and Heaton returned to England. Sometime between 1645 and 1648 he married Grizell Medhop, but little more is known about Heaton's life until September 1660 when he was granted the return of his rectory at Birr. In November 1660 he was appointed Dean of Clonfert, and in January 1661 Trinity College, Dublin, awarded him a Doctorate of Divinity. Richard Heaton died about Christmas 1666.

During Richard Heaton's first period in Ireland he travelled about the country collecting plants. His botanical activity initiated the scientific study of Irish flora. Heaton also collected in Yorkshire, the Cotswold Hills, Devonshire, and Kent probably between 1641 and 1650.

The appearance of a biography of an 'Irish' naturalist is a rare event. Walsh has taken the few facts previously known about Heaton, amplified them by much careful research, and woven them into a history of the Heaton family, their Yorkshire origins and contemporary Ireland. The book fills one of the many gaps in Irish, and British, biohistorical literature. It is unfortunate, therefore, that the book contains errors, some of which could have been removed by careful reading of the manuscript. For example on p 57, Walsh repeats the old statement that How's *Phytologia* (1650) contains the 'earliest printed records of Irish Plants', and yet on the same page he noted that in 1640 John Parkinson published a record of *Drosera*, communicated by Zanchie Silliard, the 'apothecarie of Dublin', in *Theatrum Botanicum* which contains the first explicit references to Irish plants (Nelson 1979). Several of the Latin names of plants are misspelt.

In the 'first Irish flora', Threlkeld's *Synopsis Stirpium Hibernicarum*, published in 1726 (not 1727), that author attributed a manuscript list of plants, from which he had 'copyed'

Irish names, to Richard Heaton. Threlkeld's opinion that Heaton wrote the manuscript can be challenged; Heaton was most unlikely to have had any knowledge of Irish. Mitchell (1974) argued that some of the Irish names given by Threlkeld could have been noted before 1641 (when Heaton returned to England) 'as their Latin polynomial equivalents are obviously taken from Gerard's *Herball*'. Mitchell continued that 'it is clear that other [polynomials] for which Threlkeld provided Irish equivalents were not published until after 1641', implying that these could not have been recorded by Heaton. But the date of publication of the Latin polynomials is irrelevant; we would hardly argue that the Irish names in a modern botanical dictionary could not have been recorded until after 1753 because the equivalent Linnaean binomials were not published earlier than that. Walsh, unfortunately, took Mitchell's argument and stated (p 60) that he 'has proved conclusively that many of the Irish names in Threlkeld were in fact, recorded after Heaton's death, some time after it'. We cannot prove, or disprove, Threlkeld's attribution. We only know that Heaton did provide William How with one Irish name for *Phytologia*, so heaton was capable of recording vernacular Irish names. It is probable that Threlkeld knew as little about the author of the manuscript as we know today, and that he simply deduced that Heaton was the author as he was the only botanist known to have collected in Ireland in the mid-seventeenth century.

While these few points do detract from the biohistorical content of the book, Father Walsh has made a valuable contribution to the scant literature on the history of Irish botany. It is illustrated with photographs (including some of original documents), contains a detailed bibliography and is carefully referenced throughout. The botanical parts may seem to be somewhat incidental to the author's main task – why are the plant names not included in the index? – but Father Walsh had done us a real service.

Mitchell, M. E. (1974) The sources of Threlkeld's *Synopsis Stirpium Hibernicarum. Proc Roy Ir Acad* **74B**, 1–6.

Nelson, E. C. (1979) Records of the Irish flora published before 1726. *Ir Biogeog Soc Bull* **3**, 51–74.

ECN

Orchids of Britain. A Field Guide by **David Lang**. Pp viii + 213 (including 10 line drawings and 49 maps), plus 32 pages of colour photographs. Oxford University Press. 1980. £9.50

Introductory sections on orchid structure, growth, vegetative and sexual reproduction, variation, ecology, classification and hybridization are followed by detailed descriptions of each of the British species supported by colour photography. Since the standard of photography is generally good (although the definition of a few, eg Fragrant and Ghost orchids, is disappointing), it is possible to identify the 49 British species without the use of a key (which is a main purpose of the book), and the detailed text descriptions should resolve any doubts. Maps showing the up-to-date distribution of each species (albeit on a vice-county basis), a limited bibliography, and a useful glossary and index are also provided.

Despite these slight short-comings, this is a well-produced book, which is likely to become a standard work for both the amateur and professional botanist.

MRDS

Bryophyte Systematics edited by **G. C. S. Clarke** and **J. G. Duckett**. Pp xii + 582, including numerous line drawings, b/w photographs and tables. The Systematics Association Special Volume No 14. Academic Press, London. (1979) 1980. £40

This collection of papers presented at the International Symposium on Bryophyte Systematics, organized jointly by the British Bryological Society and the Systematics Association and held at the University College of North Wales, Bangor in August 1978, examines the present state of the subject. Not since Frans Verdoorn's important *Manual of Bryology* published in 1932 has bryological research been collected together in a single comprehensive volume.

This volume contains a synthesis of the current knowledge of bryophyte systematics in the

form of nineteen papers which critically examine such aspects as phylogeny, taxonomy (including chemotaxonomy), evolution, cytology, sporogenesis, spermatogenesis, phytogeography, eco-physiological and climatic adaptations, and show the value of, for example, rhizoids, peristomes, spores, spermatozoides, and conducting tissue in classifying bryophyte taxa. Chapters are also provided on bryological exploration of North Wales and on a historical review of Japanese bryology. Extensive bibliographical lists follow each chapter and there are taxonomic, author and subject indices. A most useful reference work for students, teachers and researchers.

Animal Identification. A Reference Guide. Volume 1: **Marine and Brackish Water Animals** edited by **R. W. Simms**, pp ix + 111; Volume 2: **Land and Freshwater Animals (not Insects)** edited by **R. W. Simms**, pp x + 120; Volume 3: **Insects** edited by **David Hollis**, pp viii+ 160. British Museum (Natural History), London/John Wiley, Chichester, 1980. 3 volume set £31.

A major bibliographic survey providing guides to taxonomic (and to a lesser extent ecological and biogeographical) literature arranged systematically (mainly to class level) and geographically: each entry is cited in full, usually in chronological order. An index to group names used in the text is provided for volume 3 only: an adjunct which would have added to the usefulness of the other two volumes. Recommended for reference and natural history society libraries.

Marine Mammals by **R. J. Harrison** and **J. E. King**. Pp 192. Hutchinson University Library. 1980. £3.95

A welcome second edition, updated and metricated, of an authoritative little book, first published in 1965. A very readable account of whales, porpoises, dolphins, seals, sea lions, walruses, manatees, and dugongs.

Mammals of the Sheffield Area by **Valerie Clinging** and **Derek Whiteley**. Pp 48, including text figures and maps, plus transparent overlay. Sorby Record Special Series No 3. Sorby Natural History Society/Sheffield City Museums. 1980. 75p (+ 18p postage) from D. Whiteley, 730 Ecclesall Road, Sheffield S11 8TB

The Moss Flora of Britain and Ireland by **A. J. E. Smith**, with illustrations by **Ruth Smith**. Pp viii + 706, including 333 figures. Cambridge University Press. 1980. £12.50 paperback

This comprehensive treatment of the British moss flora (see *Naturalist* **104**: 42) has now been issued in paperback at a price more suited to the pockets of undergraduates and amateur naturalists — which should do much to promote further interest in these fascinating plants among a wider audience.

Propagation by **Alan Toogood**. Pp 320, including numerous line drawings and tables, plus 16 pages of black and white photographs. Dent. 1980. £7.95

A comprehensive, well-organized and well-illustrated account of all aspects of plant propagation, by an author who is thoroughly familiar with the practicalities and problems of his subject. This book should prove invaluable to the amateur gardener and horticulatural student.

Late Victorian Roses by **Peter Beales**, with colour photographs by **Keith Money**. Pp 32. Jarrold Colour Publications, Norwich. 1979. 75p

Edwardian Roses by **Peter Beales**, with colour photographs by **Keith Money**. Pp 32. Jarrold Colour Publications, Norwich. 1979. 75p

Two further booklets in this excellent series which maintain the high standard of presentation of the two earlier titles (see *Naturalist* **103**: 82). Several varieties unlikely to be well known to most rosarians are included.

Butterflies and Moths of Britain and Europe by **John Wilkinson and Michael Tweedie**. Pp 128, illustrated. Collins. 1980. £4.95 hardback, £2.25 paperback

This is an attractive little book with a handsome cover, an informative text and generally good colour illustrations of selected butterflies and moths. There are 47 pages each for the 350 species of butterflies and 2000+ moths of Britain and Europe, so the treatment is six times as detailed for the former as for the latter. 93 butterflies and the same number of moths are treated, text and colour paintings pleasingly intermingled on each page, with caterpillars and adults shown in more or less natural postures and situations.

The book begins with pictures of the main groups (eg Blues, Hairstreaks) giving the pages in which they are discussed in detail. An introduction gives a useful summary of life history and biology. There is a short postscript on adaptations to predators, and an index.

A handy, well-produced book for the enquiring traveller, much more useful for butterflies than for moths.

SLS

SOCIETY REPORTS AND PUBLICATIONS

Bradford Naturalists' Society: Annual Report for 1979. Pp 25. Obtainable from Mr G. W. Priestley, 54 Falcon Road, Bingley, West Yorkshire BD16 4DW. Price 50p + 17p postage.

Castleford & District Naturalists' Society: Report for 1978. Pp 44. Obtainable from Miss M. C. Hoyle, 6 Grove Lane, Knottingley WF11 8ES. Price 30p + 20p postage.

Huddersfield Birdwatchers' Club: Birds in Huddersfield 1978. Pp 60. Obtainable from Mr J. E. Dale, 158 Lindley Moor Road, Lindley Moor, Huddersfield HD3 3UE. Price 80p + 17p postage.

Leeds Birdwatchers' Club: Twenty-eighth Report 1979. Pp 48. Obtainable from Mr P. Singleton, 61 Parkland Drive, Leeds LS6 4PP. Price 50p + 17p postage.

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Edited by M. R. D. SEAWARD, MSc, PhD, FLS, The University, Bradford

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ECOLOGICAL STUDIES AT ASKHAM BOG NATURE RESERVE — 2. THE TREE POPULATION OF FAR WOOD

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Introduction

Askham Bog is a small wooded valley mire about 5 km SW of York, surrounded and divided into compartments by dykes (Fig 3). Its history and ecology were reviewed by Fitter and Smith (1979). A more detailed report on the interrelationships of vegetation and environment, with particular reference to Far Wood, is presented by Fitter *et al* (1980). This paper reports work on the age-class structure of the tree canopy of Far Wood and its implications to the succession in that compartment. The field work was carried out in October 1978 and was presented fully in Tucker (1979a).

The Physical Environment

The dominating physiographic feature of Far Wood is the *c*35 cm high dome towards its centre. The significance of this feature is discussed by Fitter *et al* (1980) and Tucker (1979a). The dome results in a lowering of pH away from the base-rich dykes towards a *Sphagnum*/*Molinia* dominated ground vegetation at the centre. The dome also affects the hydrology of the compartment, maintaining a high water table, relative to soil surface, towards the centre. Further, the concentrations of two ions in solution at the water table are similarly concentrically distributed: concentrations of sodium and calcium (Figs 1a and 1b) decrease away from the dykes. The levels of phosphate and potassium are not, however, concentric (Figs 2a and 2b). The anomalous distribution of phosphate is the subject of continuing investigations.

Ground Vegetation

The ground vegetation, discussed in detail by Fitter *et al* (1980), is zoned according to topography. They enumerate twelve vegetation types (A–L) though for simplicity only two zones will be used in this work. The central zone (A) comprises Fitter *et al*'s vegetation types G–L and represents base-poor vegetation with for example *Molinia caerulea*, *Sphagnum fimbriatum* and *S. palustre* and *Lonicera periclymenum*. The peripheral zone (B) comprises vegetation types A–F and consists of base-rich vegetation with characteristic species such as *Filipendula ulmaria* and *Galium palustre*. Zones A and B are presented in Fig 3. They were obtained by Ward's method of cluster analysis performed using the CLUSTAN IC package on frequency data of twenty species of ground vegetation sampled at sixty-four sample sites in Far Wood (Tucker, 1979a). The twenty species had been shown by Fitter *et al* (1980) to be typical indicators of base-rich and base-poor vegetation. Tree data presented subsequently was also obtained at these sample sites, which were chosen on a randomized grid system (Tucker, 1979a).

Tree Vegetation

(i) *Distribution*

Fig 4 summarizes the distribution of the canopy occupancy by the four major tree species in Far Wood. Birch, *Betula pubescens*, is widely distributed and oak, *Quercus robur*, is general though more frequent away from the dykes. Sallow, *Salix caprea*, is restricted to the immediate vicinity of the dykes and is particularly frequent in the SW. The distribution of alder, *Alnus glutinosa* is detailed in Fig 5 — the species occurs near the north and east dykes and widely in the NW corner.

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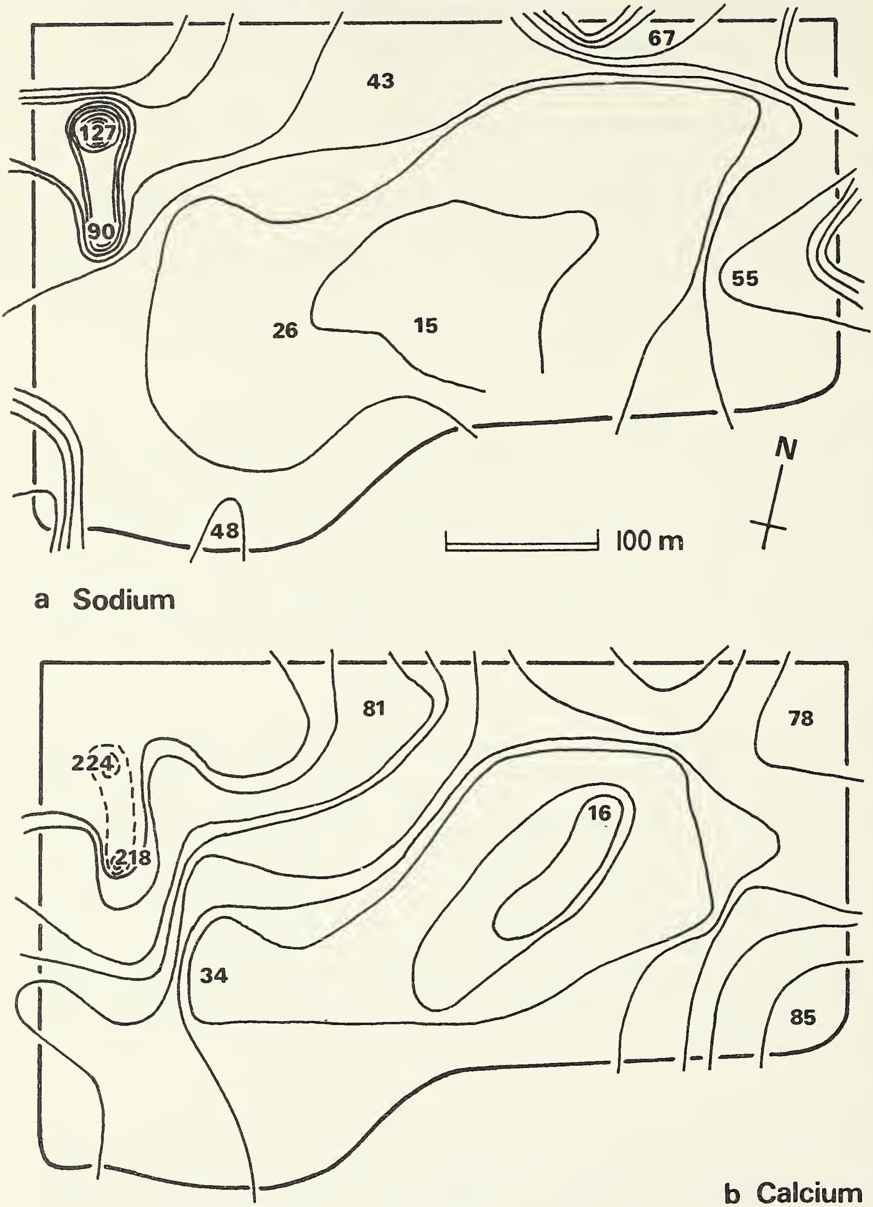

FIGURE 1
Concentrations in ppm (parts per million) of ions in solution at the water table in Far Wood, Askham Bog, October 1978.
a, sodium and b, calcium, determined by flame photometry, with contours at 10 ppm intervals, except above 100 ppm for calcium. Selected spot-readings added.

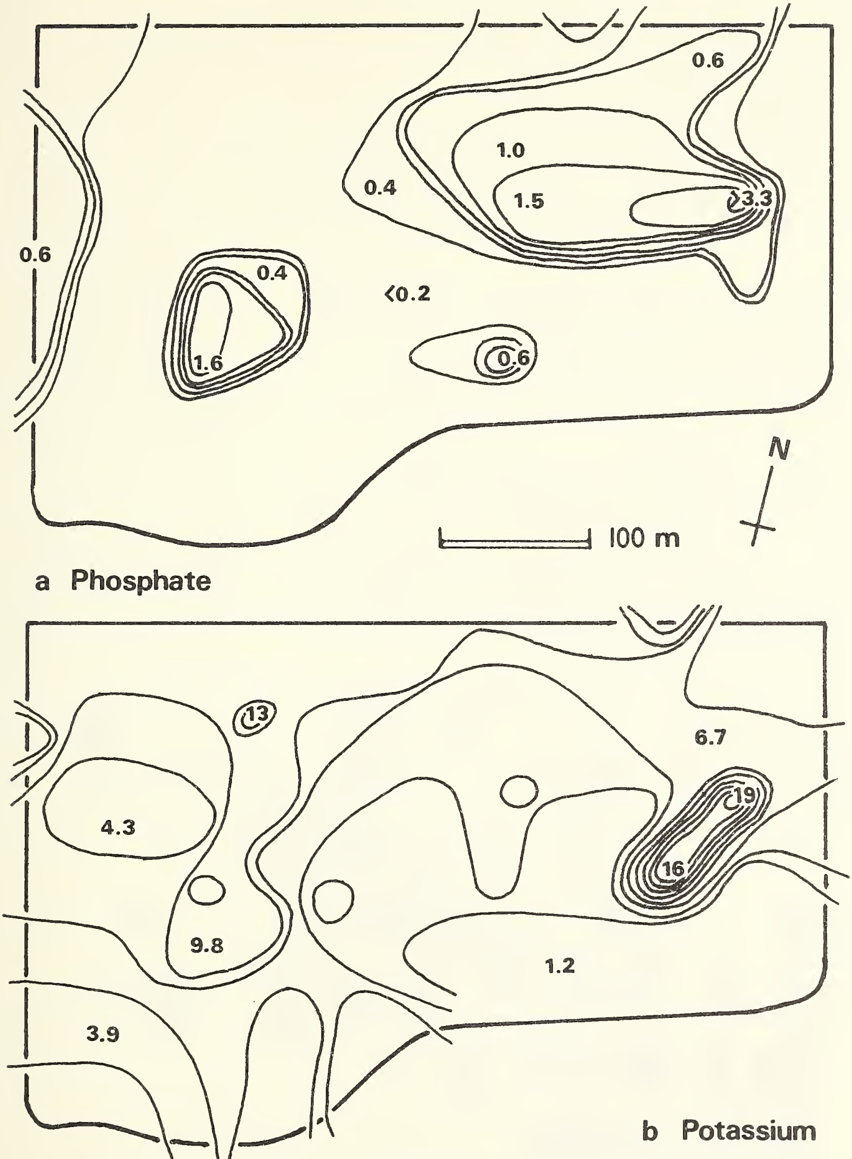

FIGURE 2

Concentrations in ppm (parts per million) of ions in solution at the water table in Far Wood, Askham Bog, October 1978.

a, phosphate, determined by colorimetry, with contours at 0.2 ppm intervals to 1.0 ppm, thence at 1.0 ppm intervals.

b, potassium, determined by flame photometry, with contours at 2.0 ppm intervals. Selected spot-readings added.

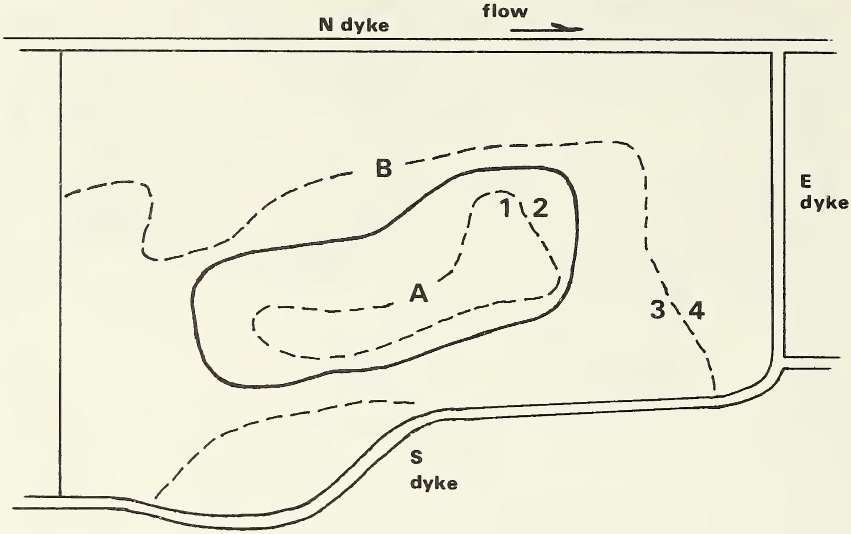

FIGURE 3
Two vegetation zones, A and B, of Far Wood, Askham Bog, used in this paper. Dashed are subdivisions between zones 1 and 2 (=A) and 3 and 4 (=B) of Tucker (1979a) from which the two vegetation zones are derived. Also shown are the three main dykes and the direction of water flow in the undammed N dyke.

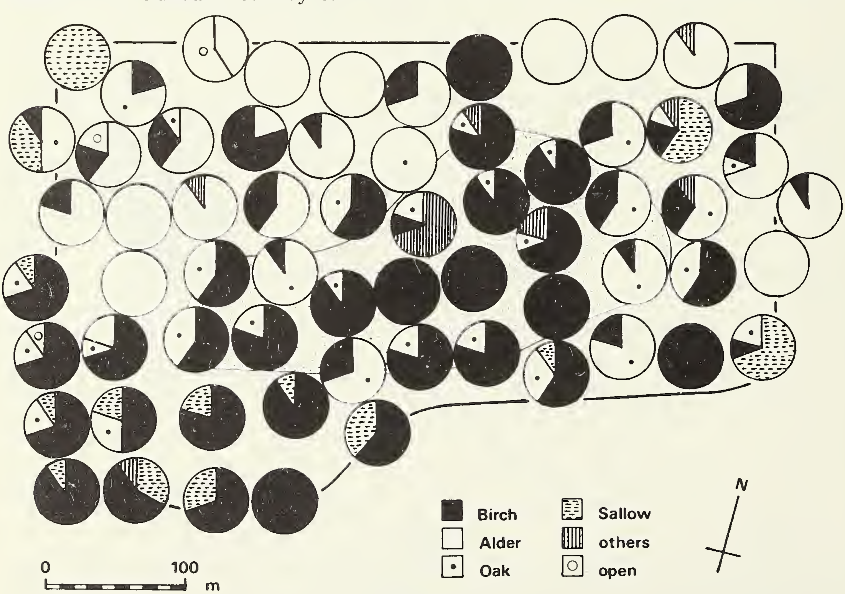

FIGURE 4
Canopy occupancy by tree species in Far Wood, Askham Bog, October 1978. The four major species and 'others' are presented, based on estimates of tenths occupancy of canopy at sample sites. The stippled area represents vegetation zone A.

(ii) *Growth-rates*

A total of 2845 trees of all species and ages were catalogued in 4 m diameter circles at each sample site. Of these 1608 were birch, 174 oak and 80 alder. The remainder were hawthorn, *Crataegus monogyna* (299), sallow, *Salix caprea* (106), hazel, *Corylus avellana* (136), ash, *Fraxinus excelsior* (40), rowan, *Sorbus aucuparia* (33), aspen, *Populus tremula* (38), alder buckthorn, *Frangula alnus* (273), grey willow, *Salix cinerea* (57), and sycamore, *Acer pseudoplatanus* (1). For every tree, diameter at breast height (DBH) was recorded (together with several other parameters not used in this analysis). An increment borer was used to extract cores from a sample of trees of each of the main species in order to establish age-DBH calibrations. Birch, being diffuse porous, has rings which are notoriously difficult to count and a method was devised for them, involving slicing, staining and particular viewing of the borer cores (Tucker, 1979b).

To test for differences in growth rates between the acid and non-acid zones samples were taken from both areas in the cases of birch and oak. Fig 6 presents the age-DBH calibrations for oak. A linear relationship of ring width to age has been assumed and the regression lines constrained through the origin (after Snedecor and Cochran, 1967). 95 per cent confidence intervals are added to Fig 6. These intervals are constructed on the basis of the regression calculated from the final data: they do not incorporate, for example, errors in annual ring counting (Tucker 1979a).

Oaks are growing significantly ($p<0.05$) more slowly in the acid zone ($n = 12$) than in the non-acid ($n = 32$) — at 0.27 cm as compared with 0.33 cm addition to DBH per year. There is no significant difference in growth rates of birch, however, the overall rate being 0.31 cm to DBH per year ($n = 26$). Alder, which grows only in the peripheral area (B), has a growth rate of 0.46 cm to DBH per year ($n = 71$).

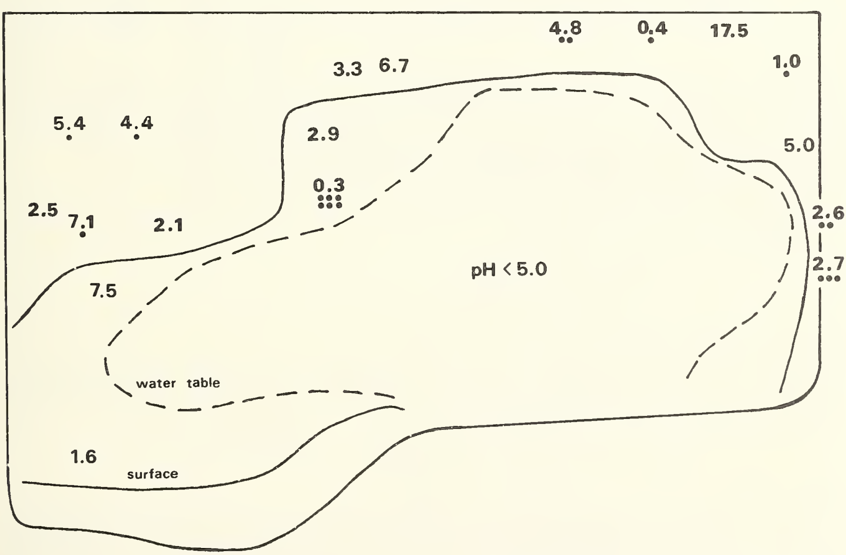

FIGURE 5

Distribution and density of alder, *Alnus glutinosa*, in Far Wood, Askham Bog, in 1978. Figures indicate basal area in thousands of cm^2 at 4 m radius sample sites. Dots indicate numbers of individuals of less than twenty years of age. Also indicated are October 1978 pH zones of less than 5.0 at the soil surface and water table.

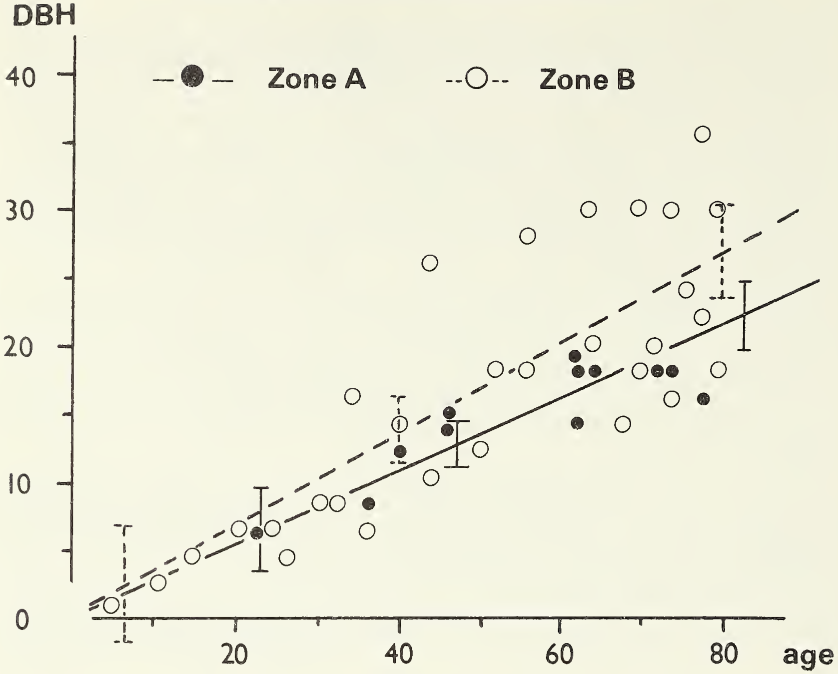

FIGURE 6

Age-DBH (diameter at breast height) calibrations for oak, *Quercus robur*, growing in the two vegetation zones of Far Wood, Askham Bog, 1978. Ages established from increment borer cores. Regressions, constrained through the origin, fitted to data from
(a) vegetation zone A (solid circles and lines); $y = 0.27x$ ($p<0.001$),
(b) vegetation zone B (open circles and dashed line); $y = 0.33x$ ($p<0.001$).
Probability associated with the differences between the two regression lines is <0.05. 95 per cent confidence intervals are added.

(iii) *Age-structure of populations*
Estimates of age (within 10 y age-classes) were made for the three principal tree species, by applying the calculated DBH increment rates to the DBH records for the remaining trees in both zone A (Fig 7a) and zone B (Fig 7b).

Modelling

At each sample site a note was made of which species occupied canopy and which were beneath it. This enabled the construction of population matrices in which, for each area, the proportions of species in the canopy represented the data for the canopy row vectors, while the proportions of the various species beneath the canopy provided the seedling input matrices. These data are shown in Tables 1 (zone A) and 2 (zone B), and were used in a model, in which it was necessary to assume (i) that saplings under the canopy were potential occupants of that canopy (understorey species were omitted from the analyses), (ii) that species were of equal competitive ability and (iii) that species were of the same seedling establishment potential and longevity.

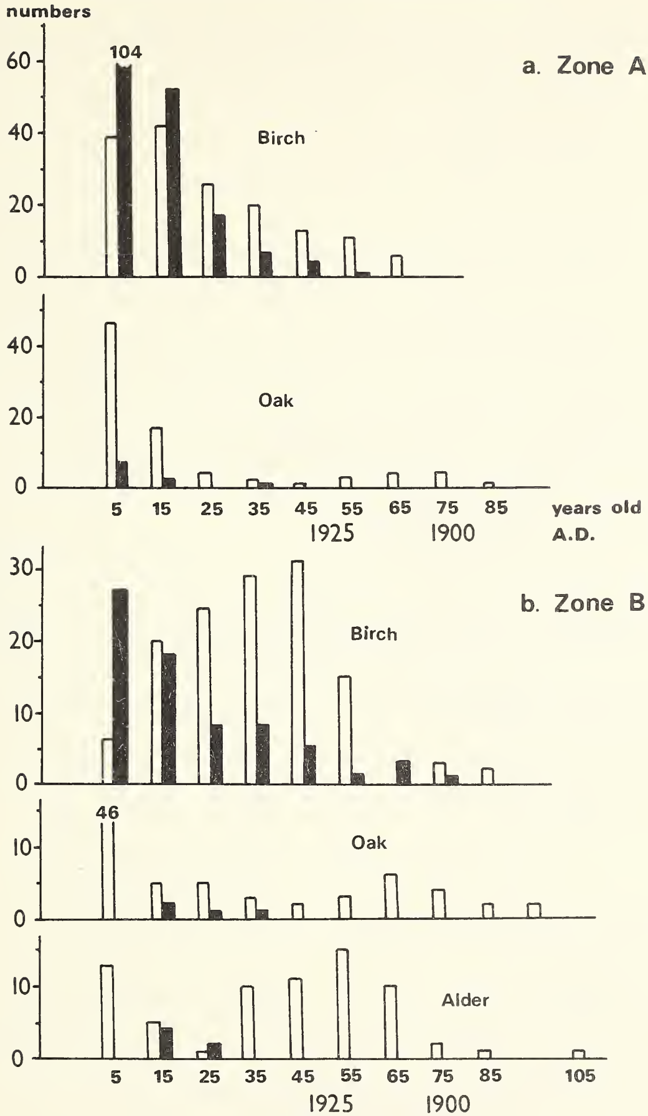

FIGURE 7

Age-structures of the three principal tree species of vegetation zones A and B (a and b respectively) of Far Wood, Askham Bog, 1978. Age figures are centres of ten-year age-classes. Years A.D. indicate approximate year of input to the population. Open columns indicate numbers of live trees, solid columns of dead trees.

a, zone A, figures for birch (341 trees) and oak (n = 93) aged by reference to age-DBH calibrations established by increment borer cores.

b, zone B, figures for birch (n = 201), oak (n = 82) and alder (n = 70), aged as for trees in zone A.

TABLE 1

Matrix of seedling input and row vector of canopy occupancy in zone A — the central, acid area of Far Wood, Askham Bog, 1978

A. Matrix of current seedling input.

		canopy	
		B[1]	0
seedlings[2]	B	0.47	0.32
	0	0.53	0.68
	n =	94[3]	22

B. Row vector of current canopy occupancy.

	B	0	n
Proportion in canopy	0.86	0.14	118[4]

1. B = birch, *Betula pubescens* and O = oak, *Quercus robur.*
2. Seedling defined as any tree developing under another which occupies canopy.
3. Fifty-nine first-year birch seedlings on a *Sphagnum* tuft counted as one, the maximum number that could have matured from that close group.
4. Excludes elements $\leqslant$ 5 per cent of canopy.

TABLE 2

Matrix of seedling input and row vector of canopy occupancy in zone B — the peripheral, base-rich area of Far Wood, Askham Bog, 1978

A. Matrix of current seedling input.

		canopy			
		B[1]	O	A	S
seedlings[2]	B	0.26	0.03	0.17	0.00
	O	0.28	0.74	0.35	0.42
	A	0.04	0.09	0.44	0.00
	S	0.42	0.14	0.04	0.58
	n =	82	35	29	12

B. Row vector of current canopy occupancy.

	B	O	A	S	n
Proportion in canopy	0.52	0.11	0.21	0.16	199[3]

1. B = birch, *Betula pubescens*, O = oak, *Quercus robur*, A = alder, *Alnus glutinosa* and S = sallow, *Salix caprea.*
2. Seedling defined as any tree developing under another which occupies canopy.
3. Excludes elements $\leqslant$ 5 per cent of canopy.

By multiplying the row vector (current canopy) by the matrix (seedling input) a new row vector (projected canopy) is produced, which is the projected canopy after one time period of unspecified duration. The model then adjusts the seedling input according to the latest canopy projection: changes in canopy proportionately changing the next seed-rain and seedling input (the next matrix). These data are then remultiplied to obtain the next canopy. The model can be re-run for as many time periods as are required but the assumptions of the model make it increasingly unreliable after only a few intervals.

This model is based upon that of Horn (1975) except that here the seedling matrix is corrected after each time period for the change in canopy proportions. Details of the model, the computer programme used to run it and the predictions based on Horn's basic model above are given by Tucker (1979a). The various models proposed by Botkin *et al* (1972), Leak (1970) and Waggoner and Stephens (1970) were unsuitable for the data currently available from Far Wood. They use such features as measurement-remeasurement data at points in the wood, mortality and longevity. At a later date more detailed work will be possible; the sample sites used in this study have been permanently marked and it is hoped to repeat the survey.

Fig 8 presents graphical representations of the calculated predictions of changes in the canopy of Far Wood according to the above model, for zones A (8a) and B (8b).

In zone A birch is predicted as declining to the benefit of oak in a relatively short period.

In zone B birch is again predicted as declining, as are alder and sallow, to the benefit of oak. In fact sallow is likely to persist, holding ground around the periphery at the edges of the dykes, being specifically adapted to those sites. It is known that alder is unable to regenerate under its own canopy (McVean, 1956a) and this may explain its apparently cyclic behaviour (Fig 7b). As its canopy occupancy declines alder may start to regenerate at some time in the future and regain dominance. The total dominance of oak is probably an artefact of the model, revealing its insensitivity to real situations.

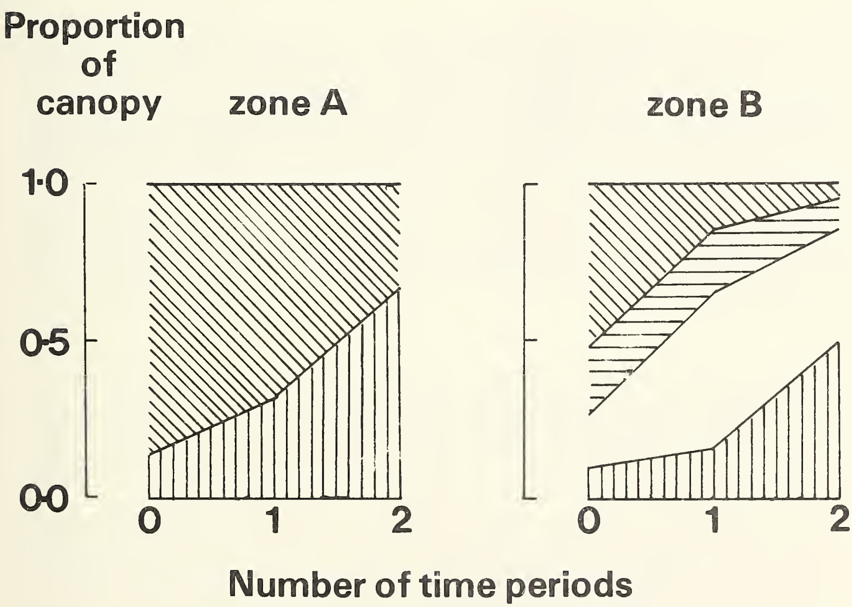

FIGURE 8

Mathematically-generated projections of probable species-composition changes in the canopy of Far Wood, Askham Bog, starting (t = 0) in 1978. Model based on that of Horn (1975), with modification; see text. Projections based on proportional occupancy of canopy (p) for two time-periods only. Projections using proportions of numbers of live trunks produce the same general trends. Species shown are: oak: diagonal hatch; birch: vertical hatch; alder: horizontal hatch; sallow: blank.

It must be emphasized that many biological and mathematical assumptions have been made in the compilation of this model and that it is not to be relied upon beyond giving indications of trends in the very short term. Its predictions towards the first time period may be taken as likely trends; those to the second time priod are shown on Fig 8.

Discussion

The effects of the dome towards the centre of Far Wood have been demonstrated previously for the ground flora by Fitter *et al* (1980), and are shown here to be important also for the tree vegetation. However, two historical events are of great significance: firstly the whole of Far Wood was clear felled in *c* 1890, and the central area over the most acid part was felled in 1927, leaving only the oak standing (Day, 1933, Fitter and Smith, 1979).

Oak

Oak is distributed away from the most base-rich zones and is shown to be growing more slowly on the acid, central zone (Figs 4 and 6). In both areas trees date from the end of the last century onwards — a peak in input being evident around 1910–20 in both zones (Figs 7a and 7b). Similarly in both zones seedling input and establishment has been improving in the two youngest age-classes.

Birch

In the central zone (A) the birch date from 1910 or so onwards (Fig 7a). The peak age-classes for live trees are 0–10 and 10–20 y, for dead trees 0–10 y. The dates of death for the latter cannot be determined. This central zone consists of dense, thin birch stems, many of which are dead, though the canopy is full. This situation is the result of a large part of the central area having been cut down in 1927 (Day, 1933). Subsequent regeneration from this effective coppicing may be largely responsible for the high density of multiple stems and concurrent high mortality due to self-thinning. Regeneration from seed is now poor, very few seedlings being found in quadrats.

In the peripheral zone (B) the birch date from the end of the last century onwards (Fig 7b). The peak age-class is 40–50 y (of zone A) for live trees, though again the peak for dead is 0–10 y. The birch here approach more typical ages of maturity, but the young trees suffer from high mortality.

Alder

Alder only occurs in the peripheral zone and its age structure is of particular interest. All sampled alders date from the late nineteenth-century onwards (Fig 7a). A peak in input is evident between 1910 and 1940, followed by a reduction for 10–20 y. A further input occurred, as shown by the high numbers in the two youngest age-classes. It is notable that the latest phase of input is now over — all the trees in the first age-class are over 5 y old and no alder seedlings were found anywhere in Far Wood during the survey period.

The distribution of the trees from the two youngest age-classes is mapped on Fig 5, where it will be seen that regeneration has apparently occurred throughout the alder area. McVean (1956c) noted that some alder populations regenerated in phases or cycles and that sometimes these would occur at the periphery of the wood.

The limitations to alder distribution may be connected with pH or with the water table during the spring. Alder has a root-nodule association with the nitrogen-fixing actinomycete *Actinomyces alni* (McVean, 1956b). The efficiency of this association decreases markedly below pH 5.0 (Ferguson and Bond, 1953). October 1978 water table and surface pH 5.0 contours are added to Fig 5. Alder seedlings are able to withstand winter flooding regimes that will kill most other forest trees (McVean, 1956a) and this could also account for the success of alder in the northern and western low-lying areas of Far Wood.

Over all, the tree population of Far Wood has developed naturally following clear-felling in 1880–90 (Day, 1933). The exception is the central area, cleared of birch in 1927 (Day,

1933). Oak, alder and birch had successive peaks of establishment. Birch is currently in decline while both oak and alder have undergone good regeneration, particularly the oak. The modelled predictions are essentially that birch will decline throughout Far Wood, to the advantage of oak in zone A and of oak and possibly alder in zone B (if the latter cycles at some time in the future).

Fitter *et al* (1980) have suggested that existence of two separate successional pathways at Askham Bog: one leading possibly to the re-establishment of ombrotrophic raised mire in the central area (zone A of this paper), and one maintaining oak woodland. The predictions in this paper certainly support the suggestion that oak is likely to predominate over birch in the future, but it is not possible in this model to allow for the possible extinction of the trees due to *Sphagnum* development. To the extent that where woodland survives it is likely to be oak-dominated, the findings of this paper support that of the earlier one.

Summary

1. The tree population of Far Wood, Askham Bog, was sampled for distribution, age-class structure and regeneration potential.
2. Alders are concentrated along the north and east dykes and in the north-west corner. Birch is widespread throughout the wood, away from the alder-dominated sections and particularly frequent towards the central, acid area. Oak also occurs away from the alder area, towards the centre.
3. Oak are growing more slowly on the central, acid area than in the peripheral area. Regeneration of oak is currently good throughout the area and projections suggest that the species will increase throughout, to the exclusion of birch in the central area.
4. Birch, present throughout the area, are failing to regenerate well from seed. In an area near the centre regrowth from stumping in *c*1926 is producing a high density of small DBH, young trees. Oak regeneration here, according to the modelled projections, is tending to lead the area to oak woodland.
5. Alder regeneration apparently peaked in about 1910–40. No alder regeneration has occurred for at least five years but may occur, in a cyclic manner, in the future. Modelled predictions, not allowing for cyclic alder regeneration, show oak becoming more abundant.
6. All trees post-date the clear felling of *c*1890. The successional predictions are in accord with those of Fitter *et al* (1980) — that oak will increase throughout Far Wood, with a corresponding decline in birch.

Acknowledgements

Dr F. B. Goldsmith for his comments on a draft, and Philip and Myrtle Radley who gave their support during the writing up. Mrs J. Tucker has assisted in many ways throughout the work.

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BOOK REVIEW

Plovers by **Richard Vaughan**. Pp. 152, with 71 black and white and 11 colour photographs by the author. Terence Dalton Ltd. 1980. £7.95.

Waders have always been an attractive group for study by ornithologists, and Richard Vaughan's book is one of a number on the subject to appear recently, including one in the New Naturalist series.

This is the author's fourth book, and his most ambitious. Early chapters deal with the distribution of the world's plovers, their place in literature and legend (the author is a historian), plumage, identification and ecology. I particularly liked the reference to the parallel derivations of the English and Latin names of the Dotterel — dote, dotage, dotty, and moron.

The main body of the book is a series of close studies of seven species of plover, all but two of which breed regularly in Britain. Although drawing heavily on the earlier researches of many other, mainly European, workers, the author has skilfully woven into the very readable text material from his own observations in the field and from the hide. The comparative dearth of the author's own observations on the breeding habits of Kentish Plover, and on the breeding of Dotterel in Britain weakens this section of the book. A Yorkshire bias is revealed in the fact that the only colour plate of Dotterel is of Yorkshire passage birds. There is no picture at all of Kentish Plover at the nest, and all the photographs of the species in the book are of the same individual bird. Not surprisingly, the author's own comments on the Grey Plover relate to his experiences with wintering birds in this country. In the chapter on the breeding habits of the Grey Plover, the work of Henry Seebohm and his other early ornithological pioneering contemporaries in Siberia is a little over-maligned in my view.

The photographs are of the high standard we have come to expect from Richard Vaughan, and the colour portraits are surely among the best ever taken of their subjects. However, the book is not merely a vehicle for the author's photographic ability. The black and white plates, in particular, are an essential complement to the text, well illustrating particular aspects of behaviour or plumage. Especially memorable are the Grey Plovers on the misty Humber shore, and the Little Ringed Plover at its nest on a Yorkshire slag heap, with pit-head gear in the background.

The book's main strength, to my mind, lies in its excellent and clearly presented distillation of previously published literature on the subject, which has obviously been meticulously researched.

The layout of the book is aesthetically pleasing, the binding is good and the plates are well printed on quality paper. A book for the general reader as well as the enthusiast.

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RIVER ETHEROW: PLANTS AND ANIMALS OF A RIVER RECOVERING FROM POLLUTION

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Introduction

During the Industrial Revolution, many textile, paper and associated industries became established along the banks of rivers in the Mersey catchment. These rivers not only provided an abundant supply of soft water for industrial processes, but also a convenient means of disposing of industrial waste and sewage. One of the areas where industry became particularly concentrated was the valley of the River Etherow, and by the 1920s it was recognized that the Etherow had the worst pollution in the catchment.

Between 1930 and the early 1970s, organic pollution in the River Etherow decreased markedly as a result of factory closures, increased control of effluent quality, re-sewerage and improved sewage treatment. By the end of 1973 the river showed obvious visual and chemical improvements, and these improvements encouraged the Stockport Federation of Anglers to stock the middle and lower reaches with large numbers of coarse fish. Against their expectations these fish apparently failed to survive.

In 1974 intensive studies were initiated by the North West Water Authority (NWWA) to discover why the River Etherow could not support fish. Caged trout were found to survive for short periods in all but the uppermost reaches, and chemical analyses of water and mosses demonstrated that a previously unknown source of zinc was probably the cause. The zinc entered the river from a minor tributary fed by underground seepages from lagoons which stored effluent from a paper processing factory. As a result of discussion between the firm and the NWWA, measures have now been taken to reduce the level of zinc reaching the Etherow.

During recent years, therefore, the Etherow has been affected by two quite different types of pollution and has undergone important changes which might be expected to influence its plants and animals. The following paper summarizes what is known about the biology of the river, and attempts to evaluate the effects of past and present pollution on algae, macrophytes, invertebrates, and fish.

Environmental Background

Physical

The Etherow rises at 472 m at the head of the Longdendale valley and has a total catchment of 154 km^2 (Fig 1). A short distance (6.2 km) from source it passes through five large reservoirs (Woodhead, Torside, Rhodeswood, Valehouse, Bottoms). Part of the water from the first three is taken to supply Manchester, while Valehouse and Bottoms Reservoirs provide compensation water to the lower river. The lower river flows for 13.3 km and drops 61 m (ie 4.6 m km^{-1}) from Bottoms Reservoir to its confluence with the River Goyt. The present account deals only with the lower river and distances down river are given here from the foot of Bottoms Reservoir. The rate of flow ranges from approximately 1.6–61 m^3 s^{-1}. Compensation water contributes *c*0.58 m^3 s^{-1} and sewage effluents *c*0.17 m^3 s^{-1}. Current speeds are often relatively high and the river bed includes many rock sheets, boulders and cobbles.

Geological

For much of its length the river drains sandstones, coarse grits and shales of the Millstone Grit series (Bromehead *et al*, 1933).

Historical

Staff of the North West Water Authority have brought together historical accounts of the condition of the river and its surrounding valley. In addition to NWWA's own records, useful facts have been given by Pearson (1939), Palmer (1950) and Barber (1969). In the 1920s industrial effluents caused severe pollution to the river and Glossop Brook. Although some firms closed during the economic slump of the 1930s, the load of organic material in the river water remained very high until about 1966, by which time the closures of a large paper mill and a textile mill in Glossop had significantly reduced the organic load. Further factory closures took place in the early 1970s, leaving only one major textile finishing works with a direct discharge to the river. This effluent was diverted to Glossop Sewage Treatment Works (STW) in 1973. Improvements to the sewerage system in the Glossop and Tintwistle areas were also completed in 1973 and the river is now affected only occasionally by overflows of untreated 'storm sewage' during wet weather.

The effluent from Glossop STW provides the largest discharge of treated sewage, but five minor sewage effluents also enter the river (Fig 1). Effluent from a number of factories is treated at Glossop STW, but no trade waste now enters the river directly. The high concentration of industry around Glossop Brook (mostly engineering, chemical and paper processing) does however lead to occasional intermittent pollution from spillages and contaminated surface run-off. Although the main source of heavy metal contamination at present is the zinc input from the paper processing factory, two other minor inputs of metals affect the river. The effluent from Glossop STW contains some chromium and Chisworth Brook (a small tributary entering near Broadbottom) is contaminated by chromium and lead from the effluent of a factory manufacturing chrome pigments.

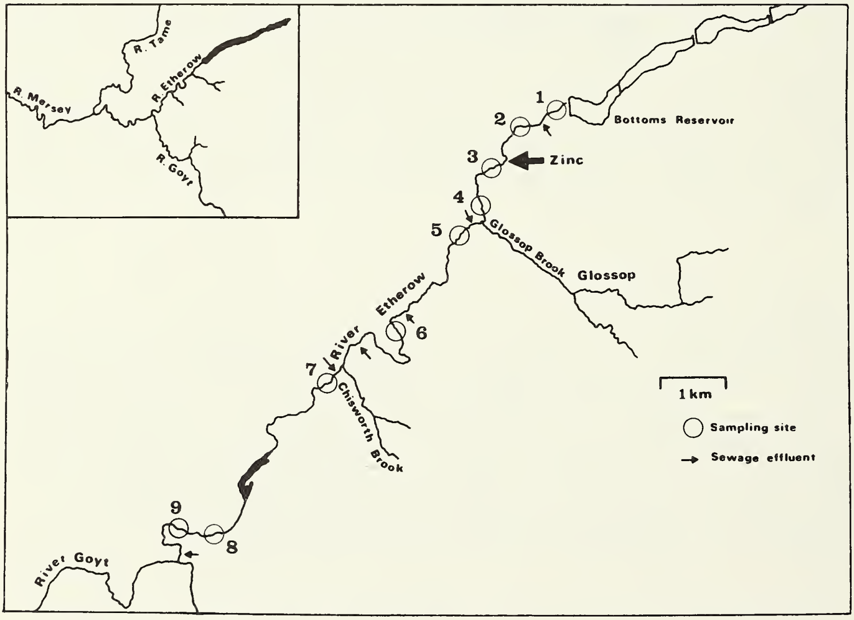

FIGURE 1
Map of River Etherow, showing important effluents and location of sampling sites.

Methods and Sampling Programme

Sampling sites

Details of the nine sites used are given in Table 1. Water from five sites (1, 4, 5, 6, 8) has been sampled by the NWWA and analysed for major chemical variables since 1953 and four sites (1, 4, 6, 8) for routine biological surveillance since 1969. Six sites (1, 2, 3, 5, 6, 9) correspond to those used in a study of metal accumulation by mosses (Say *et al*, in press).

Water

Data on the composition of water at site 9 before 1979 were obtained from the NWWA Water Quality Archive. Details of analytical techniques can be obtained from the authority if required. In addition samples of water were collected from sites 1, 2, 4, 5, 6, and 8 on the following dates: 24.7.79, 22.8.79, 2.10.79, 27.10.79, 16.1.80. The methods used for the collection and subsequent analysis of these samples have been summarized by Holmes and Whitton (1981).

Algae

Samples of submerged attached algae were collected from sites 1, 2, 3, 5, 6, and 9 on 24.7.79. The collection technique (described in detail by Holmes and Whitton, 1981) involved the removal of algae from all visible microhabitats within a 10 m reach at each site so as to represent 'aggregates' of all plant material present. Live samples were examined microscopically and the abundance of each photosynthetic plant taxon was scored on a scale increasing from 1 to 5 (rare, occasional, frequent, abundant, very abundant). For the purposes of this paper, only taxa present at or above abundance 2 have been included in Table 4.

Macrophytes

As part of a broad survey of river plants in the southern part of the NWWA area (Harding, 1979) records were made on 23.8.78 of all macrophytes (Holmes and Whitton, 1977) within 0.5 km lengths of river adjacent to sites 1, 2, 3, 4, 6. Each taxon was scored on a scale indicating relative abundance within that 0.5 km length, i.e. the type of information resembles that recorded for algae. A few additional species found during surveys after August 1978 are noted on Table 5. The taxonomic code is that of Holmes *et al* (1979). Records of the exact limits of the 0.5 km lengths are available from the NWWA.

Invertebrates

The data on invertebrate distribution are derived from two types of survey used for biological surveillance by the NWWA.

1. Historical data on the occurrence of major invertebrate taxa at sites 4 and 8 have been obtained from records of 'routine' biological surveys carried out (mostly at four-monthly intervals) between June 1969 and February 1980. Such routine surveys are carried out to enable the rapid detection of changes in water quality, and invertebrates (collected by a standard kick-sampling technique) are identified (usually to generic level) and counted in the field.

2. An 'intensive' survey of invertebrate distribution was carried out on 27 — 28.6.79. Samples from sites 1, 2, 3, 4, 6, 7, and 8 were collected by the same technique used for routine surveys, but representatives of all taxa present were preserved in 70 per cent ethanol and returned to the laboratory for identification to specific level wherever possible.

Records for both types of survey are given on a scale of 1–5, corresponding to the following estimates: 1 = 1 – 2 individuals; 2 = 3 – 10 individuals; 3 = 11 – 50 individuals; 4 = 51 – 200 individuals; 5 = 201 – 1000 individuals. In addition, values for Trent Biotic Index (Woodiwiss, 1964) have been calculated for each sample. This index is used to describe the response of invertebrate communities to organic pollution, and is based on the fact that decreasing levels of dissolved oxygen eliminate key groups of invertebrates in a well established order. Values range from zero in streams with no invertebrate life to ten for a diverse fauna dominated by stonefly and mayfly nymphs. The taxonomic code is that of Maitland (1977).

TABLE 1

Location of sites used for sampling

Site	Name	Equiv site in Say et al (in press)	Durham code stream/reach	Grid ref	km from reservoir	Survey				
						chemistry	algae	macrophytes	invertebrates	fish
1	Downstream of Bottoms Reservoir	I	0255/05	SK 023972	0.20	+	+	+	+	
2	Downstream of Tintwistle sewage treatment works	II	0255/10	SK 016968	0.83	+	+	+	+	
3	Downstream of J. Walton's weir	III	0255/20	SK 013962	1.65	+	+	+	+	+
4	Downstream of Wooley Bridge			SK 010954	2.60			+	+	+
5	Downstream of Glossop Brook	IV	0255/25	SK 004949	3.55	+	+			
6	Broadbottom	V	0255/30	SJ 997934	5.35	+	+	+	+	+
7	Bothams Hall			SJ 984929	7.93			+	+	+
8	Compstall bridge			SJ 961908	11.80				+	
9	Downstream of Compstall weir	VI	0255/80	SJ 962908	2.20	+	+	+		+

TABLE 2

Water chemistry at six sites on River Etherow taken during five surveys in 1979/80 (see Methods for dates; data for NO_3–N based on only two surveys)

Site	*pH range*	*Total alkalinity* (μ *equiv* l^{-1}) $\bar{x}$	*Ca* (*mg* l^{-1}) $\bar{x} \pm$ SD		*Zn* (*mg* l^{-1}) $\bar{x} \pm$ SD		*NO_3–N* (*mg* l^{-1}) $\bar{x}$		*PO_4–P* (*mg* l^{-1}) $\bar{x} \pm$ SD		*Cl* (*mg* l^{-1}) $\bar{x} \pm$ SD
1	5.1–6.8	0.34	4.4	1.1	0.024	0.010	0.72	0.012	0.008	15.8	1.5
2	5.0–6.6	0.28	4.9	1.6	0.032	0.020	0.98	0.033	0.020	16.8	2.1
3	5.3–6.9	0.62	6.7	0.95	0.52	0.21	1.05	0.035	0.022	26.4	8.4
5	6.0–7.4	1.5	12.8	1.1	0.26	0.12	1.26	0.140	0.100	27.7	4.4
6	6.4–7.5	2.9	16.0	2.7	0.23	0.08	1.05	0.460	0.293	32.1	5.1
9	6.4–7.7	3.2	17.2	1.2	0.25	0.22	1.40	0.367	0.310	37.2	14.1
Zinc-rich tributary	5.9–6.6	4.0	24.7	3.7	14.6	4.3					

TABLE 3

Long-term changes in 5-day BOD (Biochemical Oxygen Demand) and zinc pollution

BOD (mg l^{-1}) at Etherow site 8								
year	n	$\bar{x}$	year	n	$\bar{x}$	year	n	$\bar{x}$
1953	3	15.5	1962	4	40.1	1971	7	6.1
1954	4	20.5	1963	4	30.9	1972	6	4.5
1955	4	30.3	1964	6	13.0	1973	5	2.6
1956	4	20.9	1965	5	10.4	1974	7	4.4
1957	4	29.9	1966	7	5.9	1975	5	4.2
1958	4	23.1	1967	6	4.3	1976	6	3.8
1959	4	18.6	1968	6	4.2	1977	6	3.2
1960	4	37.1	1969	6	4.8	1978	6	2.8
1961	4	27.8	1970	5	5.1	1979	6	4.5

Zn in unfiltered water (mg l^{-1})				
	Etherow site 8		*Zn-rich tributary*	
year	n	$\bar{x}$	n	$\bar{x}$
1975	1	0.35	1	72.9
1976	16	0.41	21	51.8
1977	3	0.37	10	32.5
1978	8	0.25	8	34.1
1979	6	0.31	8	17.6

Fish

The occurrence of fish at five sites (3, 4, 6, 8, 9) was investigated by electrofishing on 3.7.79. At each site 50 m of river was fished using a 240v DC Erskine generator by wading upstream between two stop nets or between a stop net and a natural barrier such as a weir.

Results and Discussion

Chemistry

The results of the July 1979 — January 1980 surveys are summarized in Table 2. Immediately downstream of Bottoms Reservoir the water is very soft, reflecting the peaty nature of the drainage area upstream of the reservoirs. Levels of alkalinity, calcium, nitrate, and phosphate rise at site 2, reflecting the influence of the first small sewage treatment works. At site 3 the main change is a marked increase in zinc due to the entry of water contaminated by the paper processing factory. Downstream of site 3 the river passes the urbanized area of Glossop drained by Glossop Brook and this, together with the effluent from a small sewage works, brings about further increase in alkalinity, calcium, nitrate, and phosphate, but a decrease in zinc due to dilution. This pattern continues downstream towards Compstall (site 8) with the entry of effluents from Glossop STW and two minor sewage works.

TABLE 4

List of algae and one lichen recorded as at least 'occasional' (see Methods) at sites I–VI on 24.7.79

Code	*Taxon*	*Site* 1	2	3	5	6	9
020200	*Batrachospermum* sp.	+	+				
210332	*Closterium rostratum* Ehr.	+	+				
210300	*Closterium* sp.	+	+				
210432	*Cosmarium punctulatum* Bréb.	+	+				
210400	*Cosmarium* sp.	+	+				
210601	*Cylindrocystis brebissonii* Menegh.	+	+				
122201	*Frustulia rhomboides* (Ehr.) de Toni not var. *saxonica*	+	+				
172194	*Microspora* sp. $> 12 \leqslant 16\ \mu m$	+	+				
211593	*Mougeotia* sp. $> 8 \leqslant 12\ \mu m$	+	+				
122700	*Navicula* sp.	+	+				
180293	*Oedogonium* sp. $> 8 < 12\ \mu m$	+	+				
013200	*Oscillatoria amphigranulata* van Goor	+	+				
211900	*Penium cruciferum* (de Bary) Wittrock	+	+				
124002	*Tabellaria flocculosa* (Roth) Kütz.	+	+				
173403	*Ulothrix moniliformis* Kütz.	+	+				
173492	*Ulothrix* sp. $> 4 \leqslant 8\ \mu m$	+	+				
210400	*Cosmarium pseudarctoum* Nordst.	+	+	+			
122002	*Eunotia exigua* (Bréb.) Grun.	+	+	+			
013601	*Pseudanabaena catenata* Lauterborn	+	+	+			
012303	*Homoeothrix varians* Geitler	+	+		+	+	
212614	*Staurastrum punctulatum* Bréb.	+	+		+	+	+
123300	*Pinnularia subcapitata* Gregory	+	+	+		+	+
122103	*Fragilaria construens* (Ehr.) Grun	+	+				+
150501	*Chlamydocapsa ampla* (Kütz.) Fott		+				
122102	*Fragilaria capucina* Desmazières		+	+			
123315	*Pinnularia viridis* (Nitzsch.) Ehr.		+	+			
120100	*Achnanthes* sp.			+	+	+	
010706	*Chamaesiphon polymorphus* Geitler			+	+	+	
123315	*Pinnularia viridis* (Nitzsch.) Ehr.			+	+	+	
121503	*Diatoma hiemale* (Lyngbye) Heiberg var. *mesodon* (Ehr.) Grun.			+		+	
121324	*Cymbella ventricosa* Kütz.			+	+	+	+

TABLE 4 *(continued)*

Code	*Taxon*	*Site* 1	2	3	5	6	9
122312	*Gomphonema parvulum* (Kütz.) Grun.			+	+	+	+
123013	*Nitzschia palea* (Kütz.) W. Smith			+	+	+	+
013301	*Phormidium autumnale* (Ag.) Gomont			+	+	+	+
123804	*Surirella ovata* Kütz.			+	+	+	+
091406	*Vaucheria sessilis* (Vaucher) DC			+	+	+	+
313001	*Verrucaria aquatilis* agg.			+	+	+	+
122007	*Eunotia tenella* (Grun.) Hustedt			+			+
122700	*Navicula cryptocephala* Kütz. var. *veneta* (Kütz.) Grun.				+	+	
173205	*Stigeoclonium tenue* Kütz.				+	+	
120114	*Achnanthes minutissima* Kütz.				+	+	+
122721	*Navicula radiosa* Kütz. (not var. *tenella*)				+	+	+
122728	*Navicula viridula* Kütz.				+	+	+
123908	*Synedra ulna* (Nitzsch.) Ehr.				+	+	+
120701	*Lemanea fluviatilis* (L.) Ag.					+	+
123310	*Pinnularia mesolepta* (Ehr.) W. Smith					+	+
120110	*Achnanthes lanceolata* (Bréb.) Grun.						+
010704	*Chamaesiphon incrustans* Grun. in Rabenhorst						+
190103	*Cladophora glomerata* (L.) Kütz.						+
121102	*Cocconeis placentula* Ehr. (not var. *euglypta*)						+
122202	*Frustulia rhomboides* (Ehr.) de Toni var. *saxonica*						+
110609	*Melosira varians* Ag.						+
172101	*Microspora amoena* (Kütz.) Lagerh.						+
122711	*Navicula gracilis* Ehr.						+
123006	*Nitzschia dissipata* (Kütz.) Grun.						+
123012	*Nitzschia linearis* W. Smith						+
012401	*Hydrococcus cestatii* Rabenhorst						+
012402	*Hydrococcus rivularis* Kütz.						+
180297	*Oedogonium* sp. > 36 μm						+

An indication of the major changes in organic pollution which have taken place in the river since the 1950s is provided by measurements of five-day BOD at site 8 (Table 3). Before 1963 very high BOD values (>20 mg l^{-1}) were frequent. By 1966 the factory closures mentioned above caused a marked reduction in BOD. The data suggest that there may have been a still further reduction in BOD following the diversion of the last organic industrial effluent to Glossop STW in 1973. The results are not however so clear-cut, perhaps due to interference with the BOD assay by the high level of zinc present.

TABLE 5

List of macrophytes found in 0.5 km lengths of river near seven sites during 1978 (recorded on 1–5 scale: see Methods), and additional records in late summer 1979 (indicated by +)

Code	*Species*	*Site* 1	2	3	4	6	7	9
		abundance scale						
383005	*Juncus bufonius* L.	1						
326601	*Racomitrium aciculare* (Hedw.) Brid.	1						
366909	*Ranunculus omiophyllus* Ten.	1						
384602	*Sparganium emersum* Rehman	1	1	2				
384603	*Sparganium erectum* L.	1	1	1		1		
383302	*Lemna minor* L.	1	1		1			
345410	*Scapania undulata* Dum.	1				1		
382502	*Glyceria fluitans* (L.) R. Br.	3	2	1	1			
361100	*Callitriche* sp. (p).	3	3	4			1	
323905	*Hygrohypnum ochraceum* (Turn. ex Wils.) Loeske	2	1	1	1	1		
323402	*Fontinalis squamosa* Hedw.	5	2	1	1	1	1	2
383001	*Juncus acutiflorus* Hoffm.	1	1	1	1	1	1	
383010	*Juncus effusus* L.	1	1	1	1		1	1
383701	*Phalaris arundinacea* L.	1	1	1	1	1	1	1
323401	*Fontinalis antipyretica* Hedw.	1				4	3	3
180200	*Oedogonium* sp.		3					
091406	*Vaucheria sessilis* (Vaucher)		5	5				
362504	*Epilobium hirsutum* L.		1	1				
326902	*Rhynchostegium riparioides* (Hedw.) C. Jens.		4	4	5	5	4	5
020701	*Lemanea fluviatilis* (L.) Ag.			1		1		1
365100	*Myosotis scorpioides* L.				1			
173205	*Stigeoclonium tenue* Kütz.				1			
384002	*Potamogeton alpinus* Balbis				+	2		1
364801	*Mimulus guttatus* DC					1		
366907	*Ranunculus hederaceus*					1		
382101	*Elodea canadensis* Michx.						1	
366201	*Petasites hybridus* (L.) Gaertn., Mey and Scherb.					1	1	
367103	*Rorippa islandica* (Oeder) Borbas					1	1	
320303	*Amblystegium riparium* (Hedw.) Br. Eur.					1	2	1
380303	*Alisma plantago-aquatica*						1	
190103	*Cladophora glomerata* (L.) Kütz.					+	5	2
382901	*Iris pseudacorus* L.							1
366501	*Polygonium amphibium* L.							+

A less detailed historical picture is available for zinc (Table 3). However, since the factory from which the zinc originates has treated paper in the same way (with zinc chloride) and has stored its effluent in the same lagoons since at least 1920, it seems likely that inputs of the metal to the river remained fairly constant until about 1975.

Algae

A list of algae is shown in Table 4. As the survey was restricted to a single day (following an extended period of low river flow), it is difficult to comment in detail. The fifty-nine taxa recorded (as frequent, abundant or very abundant) showed an obvious downstream zonation, with sixteen taxa at sites 1 and 2 only and thirteen taxa at site 9 only. Attached filamentous algae formed the most abundant visible algal growths at all six sites, thoughtthe dominant species changed downstream. *Microspora* sp. was the most abundant algae at sites 1 and 2 but absent elsewhere. A surprising feature was the restriction of *Cladophora* to the lowermost part of the river, a distribution confirmed both in the macrophyte survey (Table 5) and general observations by the authors. It seems very likely that this is due to the influence of zinc at sites 3 and 4. *Cladophora* is often very sensitive to zinc pollution, though the presence of high aqueous levels of phosphate can markedly reduce its sensitivity (Whitton, 1980). As abundant growths did occur at site 7 where average levels of zinc are about half those at site 4 (Table 2), it seems that aqueous levels of zinc in the middle stretches of the Etherow are usually just above the limits of tolerance of this algae. Further reductions in zinc inputs to the river may therefore lead to large increases in *Cladophora. Oedogonium* sp. $>36\,\mu m$ is another species which, though of much lesser importance, may show a similar response to *Cladophora*.

Macrophytes

The occurrence and estimated relative abundance of all macrophytes recorded in 0.5 km lengths at seven sites are shown in Table 5. Althogh submerged or emergent angiosperms were recorded at all sites, the vegetation was in all cases dominated by attached filamentous algae *(Vaucheria*, *Cladophora)* or by submerged bryophytes. This is probably due largely to the rocky nature of the river bed and the relatively fast current speeds at most sites, but it is also possible that rooted aquatic macrophytes have not yet realized their full potential range of distribution within the river. A downstream zonation of macrophytes was apparent and several species showed clearly defined ranges of occurrence. This zonation is illustrated most clearly by the seven submerged bryophytes. Two species, *Scapania undulata* and *Racomitrium aciculare*, were confined almost exclusively to site 1 upstream of any inputs of treated sewage. The relative abundance of both *Fontinalis squamosa* and *Hygrohypnum ochraceum* was also greater at site 1 than further downstream. In contrast, *Rhynchostegium riparioides* was absent from site 1, but appeared as abundant growths immediately downstream of the small sewage effluent between sites 1 and 2; it was the most abundant bryophyte at all sites downstream of site 2. With the exception of a single plant noted at site 1, *Fontinalis antipyretica* was recorded only at sites downstream of the entry of Glossop Brook. Similarly, *Amblystegium riparium*, a species noted for its tolerance of organic pollution and preference for high nutrient levels (Holmes and Whitton, 1975) was recorded only at sites downstream of the effluent from Glossop STW.

Invertebrates

The results of twenty-five routine surveys of invertebrates carried out at sites 4 and 8 between June 1969 and February 1980 are summarized in Tables 6 and 7, together with values of Trent Biotic Index (TBI) for each sample. At site 4 'sewage-fungus' was present until September 1971 and the fauna usually consisted solely of tubificid worms and chironomid. larvae. The cessation of organic discharges to the river upstream of the site brought about a marked change in the invertebrate fauna between September and November 1971, with three taxa (*Baetis*, *Rhyacophila* and Polycentropidae) being recorded for the first time and values

TABLE 6

Records of Trent Biotic Index and the occurrence of 'sewage-fungus' and invertebrates at site 4 between 1969 and 1980. Invertebrates are recorded on a scale of increasing abundance from 1 to 6.

Code	Taxon	26.6.69	19.10.70	28.4.71	9.9.71	30.11.71	26.5.72	25.11.72	7.2.73	14.9.73	29.3.74	10.10.74	4.4.75	5.9.75	18.3.76	24.7.76	26.11.76	14.7.77	7.11.77	22.2.78	26.6.78	16.10.78	17.6.79	28.6.79	17.10.79	21.2.80
	Trent Biotic Index	4	2	2	2	5	5	4	1	5	5	5	5	4	5	6	6	6	4	5	5	5	7	6	5	7
	'sewage-fungus'	+	+	+	+																					
16030000	Tubificidae	3	3	3		3	2		2		2	1		1		3	2			2	2		2		1	
40090000	Chironomidae	5	3	3	4	3	2	2		2	2		1	2	1	2	2	2	3		3	3	2	3	3	1
30020100	*Baetis* sp(p).					3	2			3	2	1	2	2	1	2	2	2	3	2	3	3	3	3	2	3
38030000	Polycentropidae					3	1	1			1					2					2	2	1	1		
38010100	*Rhyacophila* sp(p).					1		1		2		1	1		1	2	2	2		1	2			3		1
36010100	*Sialis* sp(p).													2				1								
38080000	Limnephilidae															2										
40013500	*Dicranota* sp(p).															2		1					1			
40150000	Simuliidae					1										2		1				2				
16060000	Lumbriculidae															2							2			
40011700	*Tipula* sp(p).																1									
17040100	*Erpobdella* sp(p).							1									1		1					1		1
48080000	Ceratopogonidae																	1		3			1	1		
19010000	Hydracarina																	2	1					1	2	
38050100	*Hydropsyche* sp(p).																	1								
14030000	Sphaeriidae																					2	1			
31030100	*Leuctra* sp(p).																						1			
35030000	Dytiscidae																						1			
31020400	*Nemoura* sp(p).																									1
16020000	Naididae																							2		
03120200	*Polycelis* sp.																									1

TABLE 7 **Records of Trent Biotic Index and the occurrence of invertebrates at site 8 between 1969 and 1980. Invertebrates are recorded on a scale of increasing abundance from 1 to 6.**

Code	Taxon	26.6.69	19.10.70	28.4.71	9.9.71	30.11.71	26.5.72	25.11.72	7.2.73	14.9.73	29.3.74	10.10.74	4.4.75	5.9.75	18.3.76	24.7.76	26.11.76	14.7.77	7.11.77	22.2.78	26.6.78	16.10.78	17.4.79	28.6.79	17.10.79	21.2.80
Trent Biotic Index		4	6	7	7	7	7	6	4	4	4	6	7	6	5	5	5	7	5	6	6	7	5	7	6	6
16030000	Tubificidae		1	3		3				2	2	2	2	2	1						2	1	3	2	1	2
40090000	Chironomidae	5	3	3	3	3	5	3	3	3	3	3	2	3	4	3	2	2	1	2	3	3	3	2	2	3
30020100	*Baetis* sp(p).	3	1	3	3		2	1			3	3	3	3	4	2	3	3	3	4	3	3	4	3	3	3
38030000	Polycentropidae		1	1	1	1		1											3			2				
38010100	*Rhyacophilia* sp(p).												2					1		2	2	2		2		
36010100	*Sialis* sp(p).							1														2				
38080000	Limnephilidae			1	1	1	1						1	2												
40013500	*Dicranota* sp(p).									2					1				1							1
40150000	Simuliidae				1							3	3	3	3	5	3	3	1	3	3	3	3	3	3	3
16060000	Lumbriculidae									1			2										1	1		
40011700	*Tipula* sp(p).							1																		1
17040100	*Erpobdella* sp(p).													2					1		1			1	1	
48080000	Ceratapogonidae																					1	1		2	
19010000	Hydracarina								1		1		2									1	2			
38050100	*Hydropsyche* sp(p).						1		1		1				3	3	3	2		2		2			2	1
14030000	Sphaeriidae							2														1				
31030100	*Leuctra* sp(p).					1																				
35030000	Dytiscidae						2		2												2		2			
31020400	*Nemoura* sp(p).						1																			
16020000	Naididae																						1			1
28030101	*Asellus aquaticus* (L.).	1	3	3	3	4	4	3	3	3	3	2	2	2	2	3	3	2	1	2	3	3	2	3	3	2
03120200	*Polycelis* sp.				3																					
13100201	*Ancylus fluvailis*					1																				
17020300	*Glossiphonia* sp(p).																						1			
13070107	*Limnaea peregra*																								1	
30030101	*Rhithrogena semi colorata*																									1
31050401	*Isoperla grammatica*			1									1													1

TABLE 7

Records of Trent Biotic Index and the occurrence of invertebrates at site 8 between 1969 and 1980. Invertebrates are recorded on a scale of increasing abundance from 1 to 6.

Code	Taxon	26.6.69	19.10.70	28.4.71	9.9.71	30.11.71	26.5.72	25.11.72	7.2.73	14.9.73	29.3.74	10.10.74	4.4.75	5.9.75	18.3.76	24.7.76	26.11.76	14.7.77	7.11.77	22.2.78	26.6.78	16.10.78	17.4.79	28.6.79	17.10.79	21.2.80
	Trent Biotic Index	4	6	7	7	7	7	6	4	4	4	6	7	6	5	5	5	7	5	6	6	7	5	7	6	6
16030000	Tubificidae		1	3		3				2	2	2	2	2	1						2	1	3	2	1	2
40090000	Chironomidae	5	3	3	3	3	5	3	3	3	3	3	2	3	4	3	2	2	1	2	3	3	3	2	2	3
30020100	*Baetis* sp(p).	3	1	3	3		2	1			3	3	3	3	4	2	3	3	3	4	3	3	4	3	3	3
38030000	Polycentropidae		1	1	1	1		1											3			2				
38010100	*Rhyacophilia* sp(p).												2					1		2	2	2		2		
36010100	*Sialis* sp(p).							1														2				
38080000	Limnephilidae			1	1	1	1						1	2												
40013500	*Dicranota* sp(p).									2					1				1							1
40150000	Simuliidae				1							3	3	3	3	5	3	3	1	3	3	3	3	3	3	3
16060000	Lumbriculidae									1			2										1	1		
40011700	*Tipula* sp(p).							1																		1
17040100	*Erpobdella* sp(p).													2					1		1			1	1	
48080000	Ceratapogonidae																					1	1		2	
19010000	Hydracarina								1		1		2									1	2			
38050100	*Hydropsyche* sp(p).						1		1		1				3	3	3	2		2		2			2	1
14030000	Sphaeriidae							2														1				
31030100	*Leuctra* sp(p).					1																				
35030000	Dytiscidae						2		2												2		2			
31020400	*Nemoura* sp(p).						1																			
16020000	Naididae																						1			1
28030101	*Asellus aquaticus* (L.).	1	3	3	3	4	4	3	3	3	3	2	2	2	2	3	3	2	1	2	3	3	2	3	3	2
03120200	*Polycelis* sp.				3																					
13100201	*Ancylus fluvailis*					1																				
17020300	*Glossiphonia* sp(p).																						1			
13070107	*Limnaea peregra*																								1	
30030101	*Rhithrogena semi colorata*																									1
31050401	*Isoperla grammatica*			1									1													1

of TBI increasing from 2 to 5. With the exception of a single 'poor' sample (TBI = 1) caused by short-term pollution, values of TBI have remained reasonably steady since then, with a population of *Baetis* sp(p). becoming established and a reduction in the abundance of tubificid worms and chironomid larvae.

At site 8 values of TBI fell within the range 4–7 on all occasions. This indicates that by 1969 organic pollution had already decreased significantly at the site, with the effects of the organic input which affected the fauna at site 4 between 1969 and 1971 being reduced by downstream dilution and self-purification. However, the sudden appearance of Simuliidae in 1974 (recorded at abundance 3 in almost all subsequent routine surveys) suggests that a significant change took place during early 1974. As the larvae of Simuliidae are filter feeders, the most likely explanation is that some change took place in the abundance or nature of suspended solids in the river water. This may have been brought about by changes in inputs from Glossop STW following the completion of extensions in 1973.

The results of an intensive survey of the distribution of invertebrates at seven sites on 27–28 June 1979 are shown in Table 8. Samples were collected after a period of low river flows when downstream drift of invertebrates would be at a minimum, and the results probably give a good indication of stable species distribution along the river. Although values for TBI were quite similar (6–9) at most of the sites, a few species showed quite clearly defined patterns of distribution which can be attributed to the effects of known inputs. For example, nymphs of the stoneflies *Amphinemura sulcicollis* and *Leuctra hippopus* and the caddis larva *Polycentropus kingii* were restricted almost entirely to sites upstream of the effluent from Glossop STW, whilst *Asellus aquaticus*, *Ephemerella ignita* and larvae of Simuliidae were recorded only at sites downstream of the effluent. Nymphs of the mayfly *Baetis vernus* were captured at all of the sites, being joined by nymphs of *B. rhodani* downstream of site 3. Records held by the NWWA indicate that *B. vernus* (like *Ephemerella ignita*) is usually recorded as a nymph in the summer only, and, in fact since records began in 1969 *Baetis* nymphs (presumably *B. vernus*) at site 1 have only been noted between June and November.

The absence of the crustacean *Gammarus pulex* from all of the sites sampled is a striking feature of the survey. In fact only one specimen of *G. pulex* has ever been recorded from the Etherow (site 6; 17.10.79) confirming Holland's (1976) observation that the species is sparse in, or absent from, several apparently suitable rivers in the southern NWWA area. No obvious explanation for this is apparent, although no detailed attempt has yet been made to correlate the distribution of riverine *G. pulex* with physical or chemical environmental variables.

Fish

Few detailed historical data are available concerning the distribution of fish in the Etherow. Records kept by the NWWA suggest that, with the possible exception of sticklebacks, fish were absent downstream of site 2 during the period when the river was affected by severe organic pollution. The unpolluted stretch of the river between Bottoms Reservoir and the input of zinc at 1.4 km has been stocked by anglers with brown and rainbow trout since at least 1970, and resident breeding populations of brown trout, perch, minnows, and sticklebacks are known to be present in this part of the river. During the 1970s occasional trout have been captured by anglers as far downstream as site 4, but the infrequent nature of such captures and the occurrence of several minor fish mortalities near site 3 suggest that fish were unable to survive for long downstream of the input of zinc.

The results of the electrofishing survey of five sites along the river (Table 9) suggest that the distribution of fish was relatively unchanged in 1979. The one trout and two perch recorded at site 3 may well have moved down from the angling club's waters near site 2 and apart from occasional sticklebacks the river appeared to be fishless between sites 4 and 7. Breeding populations of gudgeon and sticklebacks were however present downstream of the weir at site 9, but there was no evidence of several thousand dace which had been taken from the River Eden (Cumbria) and stocked at the site in 1978.

TABLE 8

List of invertebrates found at seven sites on 27–28 June 1979, together with values of Trent Biotic Index for each sample

	Site	1	2	3	4	6	7	8
	Trent Biotic Index	9	7	9	6	9	7	7
Code	*Taxon*							
38030303	*Polycentropus kingii* McLachlan	2	2	1	1			
38080000	Limnephilidae	1		1				
31020202	*Amphinemura sulcicollis* (Stephen)	3	2	2		1		
40090000	Chironomidae, red, thummi type	1	1			1		
19010000	Hydracarina	2	2	2	1	2		
40013500	*Dicranota* sp.	2		2			1	
16030000	Tubificidae	3	2	1		3	2	2
35030703	*Potamonectes depressus elegans* (Fabricius)		1	1				
31030103	*Leuctra hippopus* (Kempny)	2		1		1		
38010101	*Rhyacophila dorsalis* (Curtis)	2	2	2	3	2		2
40090000	Chironomidae, not thummi type	3	3	3	3	3	3	2
35030802	*Oreodytes sanmarki*	3	1	2	1	1	1	2
30020103	*Baetis vernus* (Curtis)	2	3	3	2	4	3	1
17020302	*Glossiphonia complanata* (L.)			1				
31020401	*Nemoura cinerea* (Retzius)			1				
16020000	Naididae			1		2	2	
18080000	Ceratopogonidae				1		1	
31070101	*Chloroperla torrentium* (Pictet)					1		
30020105	*Baetis rhodani* (Pictet)				1	2	1	1
17040102	*Erpobdella octoculata* (L.)				1			1
28030101	*Asellus aquaticus* (L.)					2	3	3
30050101	*Ephemerella ignita* (Poda)					3	2	3
40150000	Simuliidae					2	2	3
16060000	Lumbriculidae						1	1

General comments

During the period covered by this account the Etherow has been affected by two major types of pollution, organic pollution from industrial effluents and sewage and pollution by zinc. Although it is impossible to separate their effects entirely or to assess the importance of other environmental or chemical factors, the present data allow a few comments to be made on the different effects of these two types of pollution on algae, macrophytes, invertebrates, and fish.

The data summarized in Table 3 show that organic pollution in the Etherow has decreased markedly during the last twenty years. Although the only historical data available on biological composition are records of invertebrate occurrence kept since 1969 these alone

TABLE 9

Results of electro-fishing survey, 2–3 July 1979

Site	*Typical depth* (m)	*Width* (m)	*Length surveyed* (m)	*Fish caught*
3	0.5–1.0	7	50	1 brown trout 2 perch
4	0.5–1.0	7	50	1 stickleback (seen)
6	0.2–1.0	10	50	0 (none seen)
7	0.2–0.75	10	50	0 (none seen)
9	0.2–1.5	15	50	13 gudgeon 20 stickleback
Glossop Brook	0.2–0.75	6	50	1 stickleback

illustrate the marked biological changes that must have followed the reduction of pollution loads. As pollution decreased at site 4 between 1969 and 1971, a clear change in community structure from a fauna dominated by tubificid worms and chironomid larvae to one dominated by mayfly nymphs took place. Changes such as these have frequently been observed following a reduction in organic pollution (eg Hellawell, 1978) and are often summarized by the use of indices such as the Trent Biotic Index used here. The increase in values of TBI at site 4 between 1969 and 1980 provides a good illustration. A further example of the effects of slight pollution by sewage is seen in the succession from an invertebrate fauna dominated by stonefly nymphs (TBI = 9) at site 1 to one dominated by *Baetis* spp. and *Asellus aquaticus* (TBI = 6 – 7) on passing down the river.

No information is available on the response of plants to changes in organic pollution since 1969. However, it seems probable that communities of algae and bryophytes changed quickly in response to reductions in organic pollution. In the River Douglas (Greater Manchester) *Cladophora*, *Amblystegium* and *Rhynchostegium*, three of the macrophytes also present in the Etherow, spread into the lower reaches within six months of the cessation of discharges from a textile treatment factory (Harding, 1980). Since rooted plants are less easily dispersed and take longer to become established, it seems possible that the angiosperms noted in the lower part of the river (Table 5) have been established for only a relatively short period. Indeed, data on macrophytes in adjoining rivers indicate that the vegetation of the Etherow may change further in future years as species already present extend their ranges or new species become introduced. Several angiosperms (eg *Potamogeton crispus*, *P. natans*, *P. pectinatus*, *Ranunculus fluitans*) are abundant in the nearby rivers (eg Tame, Goyt) but absent from the Etherow (Harding, 1979), despite similarities in river flow, substrate type and water quality.

Although less information is available on pollution by zinc than by organic material, it seems likely that the level of zinc entering the Etherow upstream of site 3 has remained relatively constant over a long period. However, the present distributions of plants and animals give few indications of the toxic effects of zinc. For example, although submerged bryophytes showed a clear zonation down the river (Table 5), none of the observed changes occurred in the first length influenced by high levels of zinc. In fact, the absence of *Cladophora* from a long stretch of the river appears to be the only obvious sign of the toxic effects of zinc on plants. This alga is almost always present in nutrient-enriched flowing waters, and in fact dominates the vegetation along most of the River Tame, a neighbouring

Mersey tributary (Harding, 1979). It seems likely that *Cladophora* will spread upstream following anticipated further reductions in levels of zinc.

Of all the organisms considered, fish appear to have suffered most from the effects of pollution in the Etherow. There was every reason to believe that coarse fish and trout would colonize the river following the reduction in levels of organic material, but levels of zinc between sites 3 and 7 were clearly too high to allow such a spread to occur. Figures given by Alabaster and Lloyd (1980) indicate that river water with hardness similar to that of the lower reaches of the Etherow should be able to support permanent populations of coarse fish and salmonids when Zn concentrations are less than about 0.7 and 0.2 mg l^{-1} respectively. The present data are in close agreement with these figures, with coarse fish being present, but trout absent, at a zinc concentration of *c*0.25 mg l^{-1} at site 9. Since zinc appears to be the main poison affecting the present distribution of fish in the river, it seems likely that the next stage in the biological recovery of the Etherow will be a marked spread of coarse fish and trout as levels of zinc decrease during the next few years.

Summary

An account is given of surveys of the chemistry, algae, macrophytes, invertebrates and fish in the Etherow, a fast-flowing river in the Mersey catchment with a long history of pollution. The river underwent considerable chemical changes between 1953 and 1973 as factory closures and the control of effluent quality caused a steady decrease in organic pollution. The level of zinc from a small tributary carrying very high levels of this metal has also started to decrease since about 1975. Marked biological changes have probably taken place as a result of the decreased organic pollution, although the only ones which are well documented are for decreases in 'sewage-fungus' and changes in invertebrate composition such as a reduced abundance of tubificid worms and chironomid larvae and the establishment of populations of *Baetis* spp. Despite the decrease in organic pollution, fish have been unable to colonize much of the river, probably due to the zinc pollution.

Acknowledgements

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BOTANICAL REPORTS FOR 1978 AND 1979 — FLOWERING PLANTS AND FERNS

The recorders wish to thank all those who have contributed to these reports. The species included are those which are new to the 10 km grid-square and are recorded in the *Atlas of the British Flora* for fewer than ten 10 km squares in the vice-county, except in the case of VC 63 where some additional species are of relevance to the check list of 1970 onwards.

The figures indicate 10 km squares. * New vice-county record.

In each vice-county list, the names of contributors are given the first time each occurs and thereafter initials are used.

1978

EAST YORKSHIRE (VC 61) (Miss E. Crackles)

There is one new vice-county record, *Azolla filiculoides* being found in a pond at Hemingborough by J.and H. Flint. Mr Chicken's record for *Petasites hybridus* at Foston on the Wolds is of great interest, being the first VC 61 record for female plants of this species.

The occurrence of *Lepidium latifolium* on recently disturbed sites in Hull is thought to be due to the germination of dormant seeds; the only previous records for the East Riding are for the Hull docks at the beginning of the century and in 1974 when archaeologists discovered seeds in a fourth-century watercourse in Sewer Lane, Hull!

There are new records at Spurn resulting from the floods early in the year, notably for *Glaucium flavum*, the only previous vice-county record being for Hornsea at the end of the eighteenth century by Robert Teesdale.

Other notable records are for species rarely recorded in the area: *Petroselinum segetum*, *Kickxia elatine* and *Silene maritima*.

The occurrence of the reddish-purple form of *Antirrhinum majus* on an old wall at Beverley has apparently gone unrecorded possibly for centuries.

Polypodium vulgare L. In sand dunes, Spurn, 54/41; E. Crackles.

**Azolla filiculoides* Lam. Hemingborough, 44/63, H. and J. Flint.

Clematis vitalba L. Disused railway station, Swine, 54/13; E.C.

Ranunculus sardous Crantz Near Broomfleet, 44/82, J. Robertson, conf R. J. Pankhurst, B.M. (Nat.Hist.).

Papaver argemone L. Near Broomfleet, 44/82; J.R.

Glaucium flavum Crantz Spurn, 54/41; B. Spence, comm. E.C.

Lepidium campestre (L.) R. Br. Foston on the Wolds, 54/05; E. Chicken.

Lepidium latifolium L. Clifton Street, Hull, 54/02, Bridlington Avenue, Hull, 54/02 and 54/03 and filled-in drain, Witham, Hull, 54/12; E.C.

Cochlearia officinalis L. River side, Faxfleet, 44/82; YNU Excursion.

Barbarea stricta Andrz. Market Weighton Canal and river bank, near Broomfleet, 44/82; YNU Excursion.

Silene maritima With. Spurn, 54/41; J. Cudworth and E.C.

Atriplex longipes x *prostrata* nm. *kattegatense* Turess. Barmston, 54/15.

Saxifraga tridactylites L. Airfield, Holme upon Spalding Moor, 44/83; A. Peacock.

Petroselinum segetum (L.) Koch Side of drain, Fosham, 1976; E. Matthews comm. E.C.

Pimpinella major (L.) Huds. Spring Head sidings, 54/02; E.C.

Atropa belladonna L. Frequent, disused railway, N. Cave, 44/83; E. Wear.

Hyoscyamus niger L. Waste ground, Clifton Street, Hull, 54/02; E.C. Spurn, 54/41; B. Spence and B. Pashby.

Linaria repens (L.) Mill. Established on railway embankment, Fountain Road, Hull, 54/03; E.C.

Kickxia elatine (L.) Dumort. Swindale, 1977, 44/93; E.W.

Viburnum lantana L. Wauldby, 44/93; E.C.

Petasites hybridus (L.) Gaertn. Mey. & Scherb. Female plants, Foston on the Wolds, 54/05; E.Ch.

Inula conyza DC. Great Gutter Lane, near Melton Woods, 44/92; E.W.

Gnaphalium uliginosum L. Spurn, 54/41; E.C.

Crepis biennis L. Alfred Gelder Street, Hull, 54/12 and Faxfleet, 44/82; E.C.

Triglochin maritima L. Riverside, Faxfleet, 44/82; YNU Excursion.

Antirrhinum majus L. A form with reddish-purple flowers on an old wall, Walkergate, Beverley, described by old inhabitants as having 'always' been there, 54/03; E. Hall. comm. E.C.

Dactylorhiza praetermissa (Druce) Soo x *D. incarnata* (L.) Soó Top Hill Lowe, 54/04, E. Cooper and E.C.

Festuca arundinacea x *Lolium perenne* = x *Festulolium holmbergii* (Dorfl.) P. Fourn. Top Hill Lowe, 54/04; E.C.

NORTH-EAST YORKSHIRE (VC 62) T. F. Medd)

Ceratophyllum demersum L. R. Foss, York; Mrs E. Bray.

Fumaria capreolata L. Hayburn Wyke 54/09; YNU Excursion.

Stellaria neglecta Weihe Dalehouse 45/71; G. Simpson.

Rhamnus catharticus L. Easingwold 44/56; TFM.

Salix aurita L. x *cinerea* L. *(S* x *multinervis)* Easingwold 44/56; T.F.M.

Dactylorhiza fuchsia (Druce) Soó x *traunsteineri* (Sauter) Soó (*D.* x *kellerana)* Near Helmsley (second VC record) D. J. Tennant det R. H. Roberts.

X *Festulolium loliaceum* (Huds.) P. Fourn. *(Festuca pratensis* x *Lolium perenne)* Riverside, Malton 44/77; T.F.M.

Bromus erectus Huds. Strensall Common 44/66; T.F.M.

SOUTH-WEST YORKSHIRE (VC 63) (D. R. Grant)

Phyllitis scolopendrium (L.) Newm. Bradley 44/12; B. and J. Lucas.
Dryopteris borreri Newm. Ogden 44/03; T. Schofield.
Polystichum setiferum (Forsk.) Woynar Stannington 43/38; C. B. Waite.
Corydalis claviculata (L.) DC. Blaxton 44/60; E. Thompson.
Arenaria serpyllifolia L. Greenfield Valley 44/60; F. Murgatroyd.
Ulex gallii Planch. Near Darton 44/31; D.R.G.
Astragalus glycyphyllos L. Near Castleford 44/42; R. F. Dickens.
Crataegus oxyacanthoides Thuill. Thorne 44/61; E.T.
Chrysosplenium alternifolium L. Broughton Hall Estate 34/95; YNU Bryol Excursion.
Foeniculum vulgare Mill. Shafton 44/31; D.R.G.
Bryonia dioica Jacq. Woolley 44/31; E. Lucas.
Carpinus betulus L. Deepcar 43/29; T.S.
Populus tremula L. Netherton 44/21; C. Braham.
Blackstonia perfoliata (L.) Huds. Near Castleford 44/42; I. Instone.
Scrophularia umbrosa Dumort. Broughton Hall Estate 34/95; YNU Bryol Excursion.
Stachys palustris L. Centre of Castleford 44/42; A. Pearson.
Galium verum L. Hessle Common, Ackworth 44/41; D.R.G.
Hieracium diaphanum Fr. Netherton 44/21; D.R.G., det C. E. A. Andrews.
H. perpropinquum (Zahn) Druce Anston Stones 43/58; D.R.G., det C.E.A.A.
Alisma lanceolatum With. Centre of Castleford 44/42; D.R.G.
Potamogeton perfoliatus L. Armley 44/23; L. Magee.
Carex lepidocarpa Tausch Near Haworth 44/03; T.S.
C. pendula Huds. Deepcar 43/29; C.B.W.
Melica nutans L. Hardcastle Crags 34/92; F.M.
Hordelymus europaens (L.) Harz Wilsic, Doncaster 34/59; D.R.G.
Apera spica-venti (L.) Beauv. Blaxton 44/60; E.T.

MID-WEST YORKSHIRE (VC 64) (J. R. Hickson)

Polypodium taxa confirmed by R. H. Roberts.
P. australe Fée On cliff, Southerscales, Chapel-le-dale 34/77; F. J. Roberts.
P. australe Fée x *P. vulgare* L. On cliff, Southerscales, Chapel-le-Dale 34/77; F. J. Roberts.
**P. australe* Fée x *P. interjectum* Shivas On cliff near Victoria Cave, Settle 34/86; F. J.R.
P. interjectum Shivas On cliff, Southerscales, Chapel-le-dale 34/77; F.J.R.
P. interjectum Shivas x *P. vulgare* L. On cliff, Southerscales, Chapel-le-Dale 34/77; F.J.R.
Ranunculus fluitans Lam. R. Aire, Armley 44/23: L. Magee.
Hornungia petraea (L.) Reichb. E. face of Pen-y-ghent 34/87; F. R. Halmshaw, seen there and reported by F.J.R.
Ulex gallii Planch. Rigton High Moor, near Beckwithshaw 44/25; Mrs. F. Houseman.
Rubus spp. determined by A. Newton:
R. sciocharis Sudre Near Robin Hole, Burley-in-Wharfedale 44/14; F.Ho.
R. eboracensis W. C. R. Wats. Langbar Road, Beamsley 44/05; F. Ho.
R. warrenii Sudre Beamsley Lane, Nesfield 44/04; F. Ho.
R. procerus P. J. Muell. Langbar Road, Beamsley 44/05; F. Ho.
R. echinatoides (Rogers) Sudre Beamsley Lane, Nesfield 44/04; F.Ho.
R. infestus Weihe ex Boenn. Near Robin Hole, Burley-in-Wharfedale 44/14; F.Ho.
Myriophyllum alterniflorum DC. Lindley Goit 44/24; Mrs J. E. Duncan; Yeadon Tarn 44/24; L. Magee.
Cynoglossum officinale L. Near Drax 44/62; D. R. Grant and T. Schofield, 1977.
Limosella aquatica L. On exposed bed of Stocks Reservoir, Bowland 34/75; P. Jepson.
Mentha x *piperita* L. var. *citrata* (Ehrh.) Briq. Bowers Row, near Swillington 44/32; L.Ma.
Sherardia arvensis L. Top of Malham Cove 34/86; F.J.R.
Juncus filiformis L. On exposed bed of Stocks Reservoir, Bowland 34/75; P. Jepson.
Epipactis atrorubens (Hoffm.) Schult. Near Ledsham 44/42; Castleford Nats.

Dactylorhiza fuchsii (Druce) Soó x *Gymnadenia conopsea* (L.) R.Br. Ribblehead 34/77; D. J. Tennant, conf R. H. Roberts.

D. fuchsii (Druce) Soó x *D. traunsteineri* (Sauter) Soó Second site in Upper Wharfedale 34/96; D.J.T., conf R.H.R.

D. maculata (L.) Soó subsp. *ericetorum* (E. F. Linton) Hunt & Summerh. x *D. traunsteineri* (Sauter) Soó Upper Wharfedale 34/96; D.J.T., 1976 and 1978, conf R.H.R.

D. incarnata (L.) Soó subsp. *incarnata* x *D. traunsteineri* (Sauter) Soó Upper Wharfedale 34/96; D.J.T., 1977 and 1978, det R.H.R.

Lemna gibba L. Stub Wood, Acaster Malbis 44/54; T. F. Medd.

Eriophorum latifolium Hoppe Two sites between Snell Holme Bridge and R. Ribble, Hellifield 34/85; YNU Excursion; Near Beckermonds, Langstrothdale 34/88; D.J.T.

Scirpus sylvaticus L. Bank of R. Ribble, Long Preston 34/85; YNU Excursion.

Schoenus nigricans L. Marsh near Carr House, Mickley 44/27; D.J.T.

Carex muricata L. subsp. *muricata* Upper Ribblesdale 34/77; seen by R. W. David in site where found by F.J.R. in 1974. Only other confirmed British station is at Nympsfield in Glos.

Alopecurus aequalis Sobol. On exposed bed of Stocks Reservoir, Bowland 34/75 D.R.G. and T.Sc., also P. Jepson.

NORTH-WEST YORKSHIRE (VC 65) (T. F. Medd)

Selaginella selaginoides (L.) Link Addlebrough 34/98; YNU Excursion.

Asplenium adiantum-nigrum L. Middleham Castle 44/18; T.F.M.

Nymphaea alba L. Great Langton on Swale 44/29; Mrs F. Houseman.

Nuphar lutea (L.) Sm. Great Langton 44/29; F.H.

Agrimonia procera Wallr. Masham 44/28; F.H.

Chrysosplenium alternifolium L. Whitfield Gill, Wensleydale 34/99; D. J. Tennant.

Hippuris vulgaris L. Great Langton 44/29; F.H.

Meum athamanticum Jacq. Four localities near Sedburgh; C. Steel and K. Kirby.

Polygonum viviparum L. Whitfield Gill, 34/99; D.J.T.

Pyrola minor L. Whitfield Gill, 34/99; D.J.T.

Lysimachia nummularia L. Whitfield Gill, 34/99; D.J.T.

Menyanthes trifoliata L. Masham 44/27; D.J.T.

Hieracium strumosum (W. R. Linton) A. Ley Great Langton 44/29; F. H. det C. E. A. Andrews.

Crepis mollis (Jacq.) Aschers. Field below Wooton Scar 34/98; YNU Excursion.

Allium oleraceum L. Masham 44/28; F.H.

Dactylorhiza fuchsii (Druce) Soó x *purpurella* (T. & T. A. Stephenson) Soó *(D.* x *venusta)* Middleham 44/18; D.J.T. det R. H. Roberts.

Carex pallescens L. Whitfield Gill, 34/99; D.J.T.

Melica nutans L. Whitfield Gill, 34/99; D.J.T.

Hordelymus europaeus (L.) Harz Aysgarth 44/08; F.H.

CASUALS and ADVENTIVES (Mrs F. Houseman)

The outstanding find this year was two fine plants of *Crepis setosa.* Twenty-seven new records of *Polygonum cuspidatum*, 4 of *Veronica filiformis* and 3 of *Aster novi-belgii* have been entered in the card index this year.

Eranthus hyemalis (L.) Salisb. (64) Widdington Manor, 1977, 44/45; L. Magee.

Papaver lecoqii Lamotte (64) Ilkley 44/14; F.H.

P. somniferum L. (64) with above; F.H.

Corydalis solida (L.) Sw. (65) Coverbridge 44/18; F.H.

Brassica napus L. (63) Sheepridge, Huddersfield 44/11; Mrs J. Lucas.

B. rapa L. (63) Bradley, Huddersfield 44/12; J.L.

Lepidium ruderale L. (61) Disused railway station, Swine 54/13; Miss E. Crackles.

Coronopus didymus (L.) Sm. (61) Humber Bank, Kilnsey, 1977, 54/41; E. Pratt comm. E.C. (64) Hull Road, York 44/65; Mrs E. Bray.

Lobularia maritima (L.) Desv. (61) Near disused Cannon Street station, Hull 54/02; E.C. (63) Sheepridge 44/11; J.L.

Arabis caucasica Willd. (61) Railway embankment near Humnanby 54/07; B. Pashby. comm. E.C. (65) High on Coverham Abbey ruins 44/18; F.H.

Sisymbrium orientale L. (63) Sheepridge 44/11; J.L.

Reseda alba L. (61) Roadside near Broomfleet 44/82; YNU Excursion.

Chenopodium murale L. (61) Garden weed, Spurn 54/41; E.C.

Geranium endressii Gay (62)* Hutton Lowcross Forestry area, Guisborough 45/61; YNU Excursion. (63) Bradley 44/12; J.L. (64) Laneside, Beckwithshaw 44/25; J. Oxtoby.

Impatiens parviflora DC. (61) Edge of cricket circle, Anlaby Road, Hull 54/02; R. Cracroft comm. E.C.

I. glandulifera Royle (61) Garden weed, Beverley 54/04; Mr Gooding; near Pearson Park, Hull 54/03; R.C. comm. E.C.

Melilotùs indica (L.) All. (61) Spurn 54/31; E.C.

Vicia sativa L. (63) Sheepridge 44/11; J.L.

Spiraea salicifolia L. (61) Development site, Bridlington Avenue, Hull 54/03; E.C.

Saxifraga spathularis x *umbrosa* (64) By stream at Kilnsey Trout Farm 34/96; J.L.

Epilobium adenocaulon Hausskn. (63) Bradley 44/12; J.L.

Angelica archangelica L. (64) By River Aire, Castleford 44/42; D. R. Grant.

Heracleum mantegazzianum Somm. & Levier (63) Spen Beck, Liversedge 44/22; (64) By River Aire, Castleford 44/42; A65 roadside, Gargrave 34/95; D.R.G.

Euphorbia lathyrus L. (61) Garden weed, Willerby near Hull 54/03; Driffield 54/05; E.C.

Rumex patientia L. ssp. *patientia* (64) Opencast site, Allerton Bywater 44/42; D.R.G.

Solanum sarrachoides Sendtn. (61) Spurn, 1977, 54/31; E.P. comm. E.C.

Erinus alpinus L. (65) Middleham Castle 44/18; T. F. Medd.

Veronica persica Poir. (63) Sheepridge 44/11; Bradley 44/12; J.L.

Mentha x *niliaca* Juss. ex Jacq. (64) Lane to Dob Park Bridge 44/15; G. Parker.

Campanula rapunculoides L. (61) Carlton Park, 1977, 44/62; E. Chicken.

Senecio squalidus L. (63) Bradley 44/12; J.L.

S. viscosus L. (64) Lane to Dob Park 44/15; Mrs J. E. Duncan; (65) Great Langton on Swale 44/29: F.H.

Doronicum pardalianches L. (64) Rougemont, Harewood, 1977, 44/24; L.M. (65) By old mill, Coverbridge 44/18; F.H.

Solidago canadensis L. (63) Sheepridge 44/11; Bradley 44/12; J.L.

Hieracium auranticum L. (62) Menethorpe 44/76; L.M.

**Crepis setosa* Haller f. (64) By Troutbeck, Lindley 44/15; J.E.D.

Egeria densa Planch. (63) Bradley 44/12; J.L.

Elodea canadensis Michx. (65) In lagoon, Great Langton on Swale 44/29; F.H.

Ornithogalum umbellatum L. (61) Roadside near Broomfleet 44/82; YNU Excursion.

Allium paradoxum (Bieb.) G. Don (64)Aberford, 1977, 44/43; E. Thompson; lane to Sand Quarry, Stutton, 1977, 44/44; D.R.G.

Crocosmia x *crocosmiflora* (Lemoine) N.E.Br. (63) Sheepridge 44/11; J.L.; (64) Laneside, Beckwithshaw 44/25; old railway station, Wetherby 44/34; F.H.

Bromus inermis Leyss. (64) Roadside, Beckwithshaw 44/25; D.R.G.

1979

EAST YORKSHIRE (VC 61) (E. Crackles)

There is an unusually large number of notable discoveries to report this year, including three new vice-county records. The most important find is that *Peucedanum palustre* occurs in some quantity in a reed bed at Hornsea Mere, thus reinstating the species both as an East Riding plant and a Yorkshire one; it no longer seems to occur at Thorne. George Bolam, the ornithologist, noted the species at Hornsea Mere in 1912 (*The Naturalist*, 1913, 2) but the fact escaped inclusion in the botanical records.

Miss Priest has shown that *Oenanthe silaifolia* is more frequent in the Derwent valley than was hitherto known, recording it for water-meadows at East Cottingwith, North Duffield, Ellerton, Thorganby, West Cottingwith, and Breighton; it is however very local, occurring in only four 10 km squares (44/, 63, 64, 73, and 74).

Ranunculus sardous Crantz Arable field, Bewholme 54/14; E. Chicken.

Cardamine amara L. Tophill Low 54/04; D. R. Grant.

Barbarea stricta Andrz. Spurn Point 54/41; H. Flint and A. Fritchley; Fulford Ings 44/64; T. F. Medd.

Hypericum maculatum x *H. perforatum* = *H.* x *desetangsii* Lamotte Near Arnold in the absence of both parents 54/13; E. Crackles.

Hypericum montanum L. Elloughton Dale 44/92, confirmation of an old record; E. Wear.

Saponaria officinalis L. Spring Head Railway sidings, Hull 54/02; E.C.

Cerastium atrovirens Bab. Barmston 54/15; E.Ch.

Stellaria palustris Retz. Breighton and Duffield 44/73; S. Priest.

Epilobium adnatum Griseb. Garden weed, Driffield: E.Ch.

Oenanthe silaifolia Bieb. East Cottingwith 44/64; S.P.

Peucedanum palustre (L.) Moench Hornsea Mere, 1978, 54/14; R. Hawley, det. E.C.

Polygonum mite Schrank Fulford Ings 44/64; Mrs E. Bray comm. T.F.M.

Polygonum cuspidatum Sieb. & Zucc. Walkington Grange tip 44/93; D.G.

Rumex tenuifolius (Wallr.) Löve King George Dock reservation, Hull 54/12; E.C.

**Rumex longifolius* DC. Naburn Sewage works 44/64; E.B. det., D. J. Hodgson.

**Vaccinium vitis-idaea* L. King George Dock reservation, Hull 54/12; E.C.

Vaccinium myrtillus L. King George Dock reservation, Hull 54/12; E.C.

Blackstonia perfoliata (L.) Huds. Elloughton Dale 44/92; E.W.; King George Dock reservation, Hull 54/12; E.C.

Bidens tripartita L. Hornsea Mere 54/14; E.C.

Senecio aquaticus x *jacobaea* = *S.* x *ostenfeldii* Druce Wharram Percy 44/86, Hornsea Mere 54/14; E.C.

Inula conyza DC. Elloughton Dale 44/92; E.W.

**Filago apiculata* G.E.Sm. Spurn Point 54/41; E.C., det C. Jeffrey.

Arctium lappa L. Hagg Bridge, Sutton-on-Derwent 44/74; E.Ch.

Cicerbita macrophylla (Willd.) Wallr. Near Hornsea 54/14; R. Hawley; Near Eppleworth 54/03; E.C.

Alisma lanceolatum With. Tophill Low 54/04; D.G.

Stratiotes aloides L. Near Beverley 54/04; S.P., conf E.C. Presumably introduced.

Orchis morio L. Newton upon Derwent 44/74: S.P.

Dactylorhiza purpurella (T. & T. A. Steph.) Sóo, form B King George Dock reservation, Hull 54/12, conf P. F. Hunt; Aldborough cliff 54/23; E.C.

Dactylorhiza purpurella x *D. fuschii* = *D. venusta* T. & T. A. Steph. King George Dock reservation, Hull 54/12; E.C.

Scirpus sylvaticus L. Fulford Ings 44/64; E.B.

Cyperus longus L. Fulford Ings 44/64; E.B.

Carex otrubae x *C. remota* = *C.* x *pseudoaxillaris* K. Richt. Arram Carrs 54/04; J. Higgins, det E.C.

Carex polyphylla Kar. & Kir. Wharram Percy 44/86; E.C.

Vulpia bromoides (L.) Gray King George Dock reservation, Hull 54/12; E.C.

Vulpia myuros (L.) C. C. Gmel. South Orbital Road, Hull 54/12; E.Ch.; Disused railway, Everthorpe 44/93 and at Eppleworth 54/03; J. Spencer and E.C.

NORTH-EAST YORKSHIRE (VC 62) (T. F. Medd)

Lycopodium clavatum L. Faceby 45/40; I. Laurence.

Silene gallica L. New Earswick, York; Dr R. Gulliver.

Chenopodium polyspermum L. Greenhouse weed, York 44/65; R. Freer; Garden weed, New Earswick 44/65; T. F. Medd.

Filipendula vulgaris Moench Saltburn 45/62; I.L. Brewsdale 45/41; I.L.

Epilobium adenocaulon Hausskn. Goathland 45/80; YNU Excursion.
E. tetragonum L. Goathland 45/80; YNU Excursion.
Populus nigra L. Hopgrove, York; R.G.
Lithospermum officinale L. Brewsdale 45/41; I.L.
Lamium hybridum Vill. Saltburn 45/62; I.L.
Anthemis cotula L. Guisborough 45/61; Mrs H. Pellant.
Leontodon taraxacoides (Vill.) Mérat Goathland; YNU Excursion.
Potamogeton polygonifolius Pourr. Goathland 45/80; YNU Excursion.
Allium oleraceum L. Middleton-on-Level 45/40; I.L.
Scirpus caespitosus L. Goathland 45/80; YNU Excursion.
Carex lepidocarpa Tausch Goathland 45/80; YNU Excursion.
C. strigosa Huds. Stittenham 44/66; Dr M. B. Usher.

SOUTH-WEST YORKSHIRE (VC 63) (D. R. Grant)

Phyllitis scolopendrium (L.) Newm. Hepworth 44/10; T. Schofield; canal, Turner Wood 43/58; E. Thompson.
Asplenium adiantium-nigrum L. Colden Valley, Halifax 44/12; F. Murgatroyd.
Thelypteris phegopteris (L.) Slosson. Near Marsden 44/01; B. and J. Lucas.
Ophioglossum vulgatum L. Pyn Flatts 44/20; Dr L. Lloyd-Evans.
Ceratophyllum demersum L. Canal, Kirkstall, Leeds 44/23; D. Sutcliffe.
Corydalis claviculata (L.) DC. Perkin Wood 44/21; Ll.E.
Rorippa amphibia (L.) Bess. River Calder, Dewsbury 44/22; D.R.G.
Hypericum montanum L. Brodsworth 44/40; E.T.
Montia sibirica (L.) Howell Hepworth 44/10; Eastwood 44/92; T.S.
Chenopodium bonus-henricus L. Brodsworth 44/40; Stanley Ferry 44/32; D.R.G.
Tilia platyphyllos Scop. Firbeck Hall 43/58; R. Smith.
T. cordata Mill. Norwood 43/48; D.R.G.
Euonymus europaeus L. Castleford 44/42; I. Instone.
Prunus avium (L.) L. Darton 44/21; E.T.
P. padus L. Slaithwaite 44/01; T.S.
Crataegus oxyacanthoides Thuill. Gildingwells 43/58; D.R.G.
Hippurus vulgaris L. Feeder stream, Langold Lake 43/58; E.T.
Bryonia dioica Jacq. Old Snydale 44/42; D.R.G.
Parietaria diffusa Mert. & Koch. Worsborough Dale 44/30; D.R.G.
Humulus lupulus L. Notton 44/31; Billingley 44/40; D. R. G. Scholes, near Rotherham 43/39; E.T.
Populus canescens (Ait.) Sm. Adwick-le-Street 44/50; E.T.
P. tremula L. Mirfield 44/11; T.S.
Salix pentandra L. Alcomden 34/93; T.S.
S. viminalis L. Slaithwaite 44/01; B. and J.L.
Hottonia palustris L. Old canal, Norwood 43/48; D.R.G.
Scrophularia aquatica L. Sheephouse Wood 43/29; Ll.E.
S. umbrosa Dumort. Near Thorlby 34/95; D.R.G.
Mimulus moschatus Dougl. ex Lindl. Alcomden 34/93; T.S.
Lycopus europaeus L. Canal, Wombwell 44/30; E.T.
Stachys palustris L. Canal, Hemingfield 44/40; D.R.G.
Sambucus ebulus L. Mirfield 44/21; E.T.
Hieracium vagum Jord. Rishworth 44/01; T.S.
Butomus umbellatus L. Canal, Kirkstall, Leeds 44/23; L. Magee.
Zannichellia palustris L. Feeder stream, Langold Lake 43/58; E.T.
Epipactis helleborine (L.) Crantz Hugset Wood 44/20 and 30; Ll.E.
Orchis mascula (L.) L. Margery Wood, Cawthorne 44/20; Ll.E.
Dactylorchis praetermissa (Druce) Vermeul. Castleford 44/42; R. F. Dickens.
Acorus calamus L. River Calder, Dewsbury 44/23; E. T. Canal, Edgerton 44/01; B. and J.L.

Carex laevigata Sm. Hazelshaw, Grenoside 43/39; D.R.G.

Festuca arundinacea Schreb. Blacktoft Sands near Goole 44/82; E.T.

Puccinellia distans (L.) Parl. Near Shire Oakes 43/58; D.R.G.

Poa compressa L. Anston Stones 43/58; YNU Excursion.

Brachypodium pinnatum (L.) Beauv. Brookhouse 43/58; E.T.

MID-WEST YORKSHIRE (VC 64) (J. R. Hickson)

Ophioglossum vulgatum L. Clough side, Middop, near Gisburn 34/84; D. R. Grant and T. Schofield.

Potentilla crantzii (Crantz) G. Beck ex Fritch In field near Skythorns, Threshfield; Miss H. Lefevre.

Chrysosplenium alternifolium L. Clough side, Middop, near Gisburn 34/84; D.R.G. and T.S.

Ribes spicatum Robson One bush in limestone gryke, Hardgate, Skythorns, Threshfield; H.L.

Peplis portula L. Margin of pond, Skell Gill Wood, Skelding 44/26; YNU Excursion.

Daphne laureola L. Roadside near Marston Moor Farm, Long Marston 44/55; D.R.G. and T.S.

Galium mollugo L. Roadside, Rathmell 34/85; D.R.G. and T.S.

Chrysanthemum segetum L. Disused airfield, Tockwith; D.R.G. and T.S.

Serratula tinctoria L. In field near Skythorns, Threshfield; H.L.

Carex spicata Huds. Roadside near Toldrum Farm, Winksley 44/27; D.R.G. and T.S.

NORTH-WEST YORKSHIRE (VC 65) (T. F. Medd)

Lycopodium selago L. Combe Scar, Dentdale 34/68; YNU Bryol Excursion and Brackensgill, Dentdale; T. Blockeel per D. R. Grant.

L. clavatum L. Combe Scar 34/68; YNU Bryol. Excursion per D.R.G.

Selaginella selaginoides (L.) Link Combe Scar 34/68; D. Wright and YNU Bryol Excursion per D.R.G.

Hymenophyllum wilsonii Hook. Combe Scar; YNU Excursion and YNU Bryol Excursion.

Phyllitis scolopendrium (L.) Newm. Brackensgill and Flinter Gill, Dentdale; YNU Bryol Excursion.

Asplenium adiantum-nigrum L. Combe Scar; D.W.

Dryopteris carthusiana (Vill.) H. P. Fuchs. Combe Scar 34/68; D.W.; Brackensgill and Combe Scar; YNU Bryol Excursion.

Thelypteris phegopteris (L.) Slossom Combe scar 34/68; YNU Excursion and D.W.; Brackensgill; YNU Bryol Excursion.

Gymnocarpium dryopteris (L.) Newm. Combe Scar 34/68; YNU Excursion and D.W.; Brackensgill and Combe Scar; YNU Bryol Excursion.

G. robertianum (Hoffm.) Newm. Combe Scar; YNU Bryol Excursion.

Ophioglossum vulgatum L. Wensley station 44/09; Mrs F. Houseman.

**Ceratophyllum demersum* L. Great Langton on Swale 44/29; YNU Bot Excursion.

Reseda lutea L. Wensley station 44/09; F.H.

Cerastium arvense L. Combe Scar 34/68; D.W.

Myosoton aquaticum (L.) Moench Great Langton 44/29; F.H.

Saxifraga hypnoides L. Combe Scar 34/68; YNU Excursion.

Myriophyllum spicatum L. Great Langton 44/29; YNU Bot Excursion.

Conium maculatum L. Dillicar, Dentdale; YNU Bryol Excursion.

Erica cinerea L. Brackensgill 34/68; YNU Bryol Excursion.

Vaccinium oxycoccos L. Combe Scar, Brackensgill and South Lord's Land, Dentdale 34/68; YNU Bryol Excursion.

Primula farinosa L. Combe Scar 34/68; YNU Excursion.

Trientalis europaea L. Gunnerside 34/99; C. R. Boon.

Centaurium pulchellum (Sw.) Druce Great Langton 44/29; YNU Bot Excursion.

Pedicularis palustris L. Brackensgill 34/68; YNU Bryol Excursion.

Taraxacum nordstedtii Dahlst. Coverham 44/08; F.H., det Dr J. Richards.
T. unguilobum Dahlst. Marsett 34/98; F.H., det J.R.
Narthecium ossifragum (L.) Huds. Combe Scar and Brackensgill 34/68; YNU Bryol Excursion.
Allium oleraceum L. Great Langton 44/29; F.H.
Epipactis helleborine (L.) Crantz Flinter Gill, Dentdale 34/78; YNU Bryol Excursion.
Listera cordata (L.) R.Br. Combe Scar 34/68; YNU Excursion.
Dactylorhiza maculata (L.) Soó Combe Scar 34/68; D.W.
Scirpus sylvaticus L. Great Langton 44/29; YNU Bot Excursion.
Carex bigelowii Torr. ex. Schwein Baugh Fell. Sedbergh 34/79; R. W. M. Corner.

CASUALS and ADVENTIVES (Mrs F. Houseman)
Cardaria draba (L.) Desv. (63) Huddersfield (2 sites) 44/12; Mrs J. Lucas; (64) Waste ground, Ilkley 44/14; Wharfedale Nat Soc.
Vaccaria pyramidata Medic. (62) Cundall village 44/47; L. Magee.
Trifolium incarnatum L. (61) In quantity, disused railway, East Hull 54/13; Miss E. Crackles.
Epilobium nerterioides Cunn. (65) Combe Scar, Dent 34/68; D.R.G.
Heracleum mantegazzianum Somm. & Levier (64) Boston Spa 44/44; D.R.G.
Polygonum polystachyum Wall. ex Meisn. (63) New Mill village 44/10; Dr L. Lloyd Evans.
Ficus carica L. (63) Huddersfield 44/10 and 44/11; J.L.
Populus canescens (Ait.) Sm. (64) Near Wighill 44/44; D.R.G.
Linaria repens (L.) Mill. (63) New Mill village 44/10; Ll.E.
Campanula rapunculoides L. (65) River bank, Great Langton on Swale 44/29; J. Oxtoby.
C. persicifolia L. (65) Great Langton on Swale 44/29; J.O.
Galinsoga ciliata (Raf.) Blake (63) New Mill village 44/10; Ll.E.
Doronicum pardalianches L. (65) Abundant, roadside, Little Langton 44/39; F.H.
Arthemis tinctoria L. (65) Roadside, Flintoft 44/39; F.H.
Cicerbita macrophylla (Willd.) Wallr. (63) Stuart Road, Pontefract 44/42; D.R.G.
Echinops sphaerocephalus L. (64) Abundant on waste ground, Ripon 44/37; F.H.
Hieracium brunneocroceum Pugsl. (61) King George Dock reservation, Hull 54/12; E.C.
Lilium martagon L. (65) Roadside, Little Langton 44/39; F.H.
Gladiolus byzantinus Mill. (61) Southcoates, Hull 54/13; E. Chicken.
Agrostis scabra Willd. (61) Spring Head railway sidings, Hull, det Dr C. E. Hubbard, 1978, 54/02; E. Crackles.
Setaria italica (L.) Beauv. (61) High Street, Hull, 1978, 54/12; E. Crackles.

FIELD NOTE

Eriozona syrphoides (Fallén) (Dipt. Syrphidae) at Wharncliffe Wood

A female specimen of this elegant hoverfly was taken by Mr Austin Brackenbury at the southern end of Wharncliffe Wood, Sheffield (SK 311937) (alt 400 ft) on 24 June 1980. This species was first found in Yorkshire at Timble Ings in 1979 by Roy Crossley (*Entomologist's mon. Mag.* **115** (1979) p 200) but the Wharncliffe specimen is apparently new to south-west Yorkshire (VC 63). These first Yorkshire records are of considerable interest, as *E. syrphoides* is thought to be a recent colonist in Britain, with a habitat preference for large coniferous woodlands. Its larvae probably feed on aphids specific to conifers, and the adult fly tends to be found along flower-rich rides and margins of such woodland (*pers comm* A. E. Stubbs).

Mr Brackenbury's collecting site lies along the edge of a main railway line which forms an effective ride through the large Forestry Commission mixed woodland, dominated by commercial conifer plantations. Other noteworthy hoverflies taken at this site since 1977 include *Megasyrphus annulipes* (Zett.), *Didea fasciata* Macq. *Xylota coeruleiventris* Zett., *Xylotomima lenta* (Mg.), *Brachypalpus bimaculatus* (Macq.) — a second Yorkshire record,

Criorhina asilica (Fall.), *C. floccosa* (Mg.), *C. berberina* (Fab.), and *C. b.* var *oxycanthae* (Mg.) which are probably associated with the mature oak, birch, sweet chestnut, sycamore and various other broad-leaved trees in the vicinity. These species are nationally scarce and indicate that the wood is a rich site for dead wood insects.

Derek Whiteley
Natural Sciences Department, Weston Park Museum, Sheffield

NOTES ON YORKSHIRE MOLLUSCA — 3
PATELLA INTERMEDIA JEFFRIES: ITS STATUS IN YORKSHIRE

A. NORRIS
Leeds City Museum

In 1973, as a result of several visits to the Yorkshire coast by the Yorkshire Conchological Society, a report was published (Norris, 1973) in which *Patella intermedia* Jeffries (= *P. depressa* Pennant) was reported as occurring at Thornwick Bay and Filey Brigg on the Yorkshire coast.

These two records confirmed the previous Yorkshire reports of this limpet from Robin Hood's Bay (F. H. Woods, Oct 1912), and Scarborough and Filey (J. A. Hargreaves, 1910).

Work carried out since this report on material collected at both Thornwick Bay and Filey Brigg has, however, proved that what was thought at the time to be *Patella intermedia*, is, in fact, a hybrid species between *Patella vulgata* (L.) and *Patella aspera* Roding. *Patella intermedia* should therefore be removed from the Yorkshire list of marine mollusca.

Records of *Patella intermedia* in Britain have only been confirmed from south-west England, Wales and western Ireland.

REFERENCES

Walsh, G. B. and Rimington, F. C. (1956). *The Natural History of the Scarborough District*. Vol 2.

Norris, A. (1973). Conchological Section: Marine Survey, Report of field trips to Scarborough, South Bay; Thornwick Bay; Flamborough and Filey Brigg, 1972. *Naturalist* 71–3.

BOOK REVIEWS

The Observer's Book of Weather by **Robert Pearce**. Pp. 192, with 16 colour and 136 black and white photographs, and 64 line drawings. 1980. Warne. £1.80.

This small, attractive book in the well-known Observer's Series bears little resemblance to the previous volume with the same title. Robert Pearce has used his expert knowledge of meteorology and particularly of weather satellite pictures to provide a series of extremely clear and pertinent illustrations of the features associated with the atmosphere's circulation. Cloud types, rainbows, mirages, lightning, depressions, fronts, fogs and a host of other phenomena are admirably explained. Besides dealing with temperate weather systems which affect the British Isles, there is a sound introduction to tropical weather systems. The sections on changes in climate and the methods and difficulties of weather forecasting incorporate recent developments and are clearly and concisely presented.

An enormous quantity of first rate material has been packed into this small pocket book and it is warmly recommended to anyone who wishes to gain an understanding of weather systems or who, having such a knowledge, would like to familiarize themselves with some of the recent advances in weather study.

DEC

Waders by **W. G. Hale**. Pp. 320, illustrated. New Naturalist, Collins. 1980. £9.50.
Hale's new book on shorebirds follows a similar pattern to the earlier bird-group titles in this series such as Finches, British Tits, British Thrushes and others. There are chapters on habitats and adaptation, geographic distribution, breeding biology, migration, feeding, and mortality in the standard mould. Since the text covers all the world's 202 species, few details are given on the natural history of individual birds. Two novel chapters are on 'carrying capacities in the non-breeding season' and 'energy balance'. The discussion of winter carrying capacity is extremely interesting and rich in ecological detail, while the energy balance chapter is a rather prosaic description of standing crop biomass in estuarine invertebrates. It is an unfortunate fact that we know so little about the breeding ecology of waders; it may well be that their populations are regulated not by the availability of winter food but by conditions in their arctic breeding grounds.

The final chapter details the extensive research on the impact of oystercatcher feeding on cockle beds and chronicles the misguided attempts to control the birds by shooting with a bounty of 25p per head. Elementary ecological theory would have been sufficient to show the folly of this approach, not to mention practical experience gained in trying to control pigeons by shooting. The oystercatchers kill large numbers of cockles only when the molluscs are abundant; at low cockle densities the birds feed elsewhere. The birds thus do no substantial harm to the fishery, killing only those animals that would otherwise have died from different causes.

This book is a valuable compendium and a useful addition to the library of ecologist and ornithologist alike.

MJC

The British Ornithologists' Guide to Birdlife edited by **Jim Flegg**. Pp. 310, many colour plates. Blandford Press. 1980. £10.95.
Originally published in Sweden in 1979, this edition has been edited by Jim Flegg and is a most pleasing production. It is really a maxi field guide to Britain and Europe and the paintings by a group of Scandinavian artists are some of the best I have seen. Editors of larger and more important volumes could do worse than consider them. Each species has adequate text on field identification, calls, breeding, food, and status (amended to suit the British edition). The plates alone justify spending £10.95 and anyone interested in birds at whatever level should have this work on the shelf.

JRM

A Guide to Seabirds on the Ocean Routes by **Gerald Tuck**. Pp. 144, with 58 line drawings. Collins. 1980. £4.50.
This splendid book takes each of the twenty-five major shipping routes around the world and lists the birds to be encountered along them; it is an absolute must for anyone contemplating a long sea voyage. The information has been collated from over twenty years' observations by members of the Royal Naval and Mercantile Marine Birdwatching Society and individuals who have taken part in the well-organized recording system of the Society. Inexpensive and fascinating enough even for the landlubber.

JRM

Bill Oddie's Little Black Bird Book. Pp. ix + 149, including numerous line drawings and photographs. Eyre Methuen. 1980. £4.95.
A lighthearted and entertaining romp through the bird-watching scene, accompanied by the author's illustrations of key pointers to bird identification and otherwise. Emphasis is placed on nomenclature, not so much of the birds as of the large variety of bird-watchers to be encountered: birders are definitely in, and twitchers are out. As the author is undoubtedly a genuine enthusiast, a hard core of useful information is occasionally to be glimpsed through the joke-screen.

Squirrels in Britain by **K. Laidler**. Pp. 192, with 18 colour and 23 monochrome plates and 26 figures. David and Charles. 1980. £6.95.

This is an attractive general account of the ecology of squirrels living in Britain. The author has a good knowledge of his facts and puts them together into a pleasant, readable account. Following introductory chapters on the biological characters of red and grey squirrels, he then goes on to discuss topics such as the interactions between the two and the spread of the grey and decline of the red, habitat requirements, social organization, movement, economic importance, and methods of study. There are numerous illustrations, the colour ones of particularly high quality. There are even recipes for squirrels and nut galantine and squirrel and vegetable stew!

This is a carefully thought out and well balanced account by someone who knows his animals well and has kept up to date with the literature. Nevertheless, he has his moments of speculation, no more so than when he proposes squirrels birth control! But this is only a trivial fantasy in a generally recommendable book.

MJD

Queen of Sharba. The Story of an African Leopard by **Joy Adamson**. Pp. 190 with 14 colour and 68 half-tone plates. Collins and Harvill, London. 1980. £8.50.

This book describes the relationship between Joy Adamson and a wild leopard which was presented to her as an orphan. Not only was she able to rear and release the leopard to the wild but the relationship was so close that the leopard permitted the author to visit her cubs reared from a mating with a wild leopard.

This fascinating account is even more poignant as the author was murdered almost immediately after the experiment ended. Some scientific information is included but the main attraction of the book is the delightful story. It follows logically after her previous books on Elsa the lioness and Pipa the cheetah, but this was a much more difficult project and a more fascinating account of the African bush. The half-tone and colour photographs are of a high quality.

AVD

The Observer's Book of Pond Life by **John Clegg**. Pp. 459 with numerous coloured and black and white illustrations. Warne. 3rd edn. 1980. £1.80.

This new edition of John Clegg's little book on pond life has been produced in the attractive new format now being used by the publishers. The illustrations (previously in the form of full-page plates), have been divided and integrated within the text. The printing methods have also increased the clarity of the illustrations, making for an even more attractive publication than previously. The text remains much the same as in previous editions, although an attempt has been made to update the nomenclature as much as possible within the confines of the book.

The book is one of the best short guides available on freshwater life, covering as it does a wide range of animals and plants found in such habitats. The Observer series have given a great deal of pleasure to naturalists of all ages, and I have no doubt that this new edition will increase the reputation of these books even further. I can highly recommend this book to all those people interested in exploring the intricate web of life found in our ponds and streams.

AN

Three Mile Man. A Countryman's View of Nature, with text by **Alan Thornhill**, photographs by **Peter Warnett**, drawings by **Lawrence Easden**, and an introduction by **Malcolm Muggeridge**. Pp. 144, with numerous coloured photographs and line drawings. Collins. 1980. £8.95.

An attractive amalgam of words and pictures descriptive of a small corner of the Sussex countryside (Rotherfield — Winnie the Pooh country), which shows what a really observant naturalist is likely to encounter within the immediate environs of a home in the country. Outstanding photography and pleasant line drawings are complemented by a sympathetic text.

Wild Flowers by **Marilyn Jones** and **Wendy Bramall**. Pp. 125, illustrated in colour. Kingfisher Books. 1980. £2.50.

If you want a book with 250 attractive paintings of British wild flowers, this is the book for you. For comparison, Keble Martin illustrates nearly 1500 species, though Wendy Bramall's paintings are clearer than his and Marilyn Jones' descriptions are considerably fuller. An interesting feature of the brief introductory matter is the painting of a 'typical flowering plant'. This is the artist's idea of an 'average' plant, and would require an entirely new order of flowering plants, if not a new sub-class, were an attempt to be made to fit it in to any of the standard classifications.

FHB

The Restoration of Land. The Ecology and Reclamation of Derelict and Degraded Land by **A. D. Bradshaw** and **M. J. Chadwick**. Pp. xi + 317, including many b/w photographs, line drawings and tables. Studies in Ecology Volume 6, Blackwell Scientific Publications, Oxford. 1980. £13.50.

Although written by plant ecologists, this volume is intended for a wider audience including planners, landscape designers, soil scientists and engineers. This intention is successfully realized: sound theoretical knowledge combined with practical application show how derelict and degraded land arising from a wide variety of activities can be restored for many uses. The authors ably demonstrate how there are few land restoration problems for which there is no satisfactory or potential solution, and how land has multiple uses and should be treated as a resource that can be used, improved, restored and recycled.

Drawing mainly on first-hand experience in many countries throughout the world, the authors show how collaboration with central and local government, industry, and research institutions can be effectively achieved.

The presentation of text and illustrations is excellent, although the quality of some of the photography lacks the desired impact due to excessive reduction. Furthermore, there are good photographic examples of sites before and after restoration, but unfortunately as these only occasionally refer to the same location, the improvement is hard to assess.

Land restoration is a challenge — this book meets that challenge in presenting a wealth of theoretical and practical information in a readily accessible form.

MRDS

The West Highland Way by **Robert Aitken**. Pp. 175, plus folding map. HMSO. 1980. £4.75.

The West Highland Way and this booklet about it have been a long time in preparation, as they were initiated by the Countryside (Scotland) Act 1967 and a Countryside Commission Report 1972. The booklet bears indelible marks of its period. We read that the authors of the Way had a 'remit' and that some of the subject matter was 'outwith' it. The design is very early 70s. It is printed in a purply-brown ink on cream coloured paper; the line drawings, probably quite good if they could be seen properly, are printed in yellow! For some reason most of the photographs, also printed in purply-sepia, show the mountains in mid winter. It is to be hoped that in the '80s such publications will move away from jargon and silly tricks of design. The Way is the first official long-distance footpath to have been established in Scotland and runs for 152 km (95 miles) from the outskirts of Glasgow to Fort William. In the booklet it is described in fourteen sections varying in length from 4 to 15 km. The information given about each section is interesting and the accompanying map makes them quite easy to follow. The latter is based on the Ordnance Survey 1:50,000 map and is in four sections. These are skewed to give as symmetrical coverage of the surrounding country as possible, which takes a little getting used to at first. By applying Naismith's Rule for timing fell walking, that is allowing an hour for each 5 km on the flat plus half an hour for each 300 m of ascent, it is obvious that an average walker could complete more than one section in a day. The booklet suggests that the whole route could be covered in a week. Many people will react to a fully signposted 'way' through the mountains with mixed feelings, but no doubt many others will welcome it, and they will need, and make good use of, this guide.

FHB

Nature Near London by **Richard Jefferies**. Facsimile reprint, with short introduction by Hockley Clarke. Pp. vii + 242. John Clare Books, London. 1980. £5.50.
A collection of essays on the natural history of the Surbiton area as recorded by Richard Jefferies (1848–87) during his residence there from 1877 to 1882. The richness of the flora and fauna of the woodlands, heathlands, riversides, etc. at that time is captured through his visual impressions, particularly of seasonal change, but his accounts are often repetitious (vide his preoccupation with the colour of grass), and are, on the whole, generalized and often wanting in scientific accuracy: they are essentially newspaper nature column material.

The Thames Valley Heritage Walk by **Miles Jebb**. Pp. 301, including numerous maps and b/w photographs. Constable. 1980. £4.95.
The latest title in the excellent Constable guide series intended for walkers with an appreciation for the natural landscape and cultural heritage. The walk, from Westminster to Woodstock, is divided into sixteen stages, each varying in distance from 4½ to 8½ miles.

Shetland's Living Landscape. A Study in Island Plant Ecology by **David Spence**. Pp. 152 + 25 pages of b/w photographs. Thule Press, Stornoway. 1979. £6.50.
A clear and informative account of the fascinating plant ecology of these islands, supported by considerable original data by the author. The text is complemented by numerous line drawings and tables; a bibliography, index to botanical names and a general index are also provided. It is unfortunate that this work will to some extent be overshadowed by the recent 'New Naturalist' publication which covers much of the same matter.

Ecology of Insect-Plant Interactions by **Peter J. Edwards** and **Stephen D. Wratten**. Pp. iv + 60, illustrated. Studies in Biology no. 121. Edward Arnold. 1980. £1.95, paperback.
The Ecology of Streams and Rivers by **Colin R. Townsend**. Pp. iv + 68, illustrated. Studies in Biology no. 122. Edward Arnold. 1980. £2.10, paperback.

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 15p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

Notice to Contributors to 'The Naturalist'

Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

Subscription rates: Issued free to individual members of the Yorkshire Naturalists' Union and to Affiliated Societies.

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SPIDERS IN YORKSHIRE

CLIFFORD J. SMITH

7 Malton Way, Clifton, York YO3 6SG

Presidential Address delivered at the Annual General Meeting of the Yorkshire Naturalists' Union, held at Rotherham on Saturday, 6 December 1980

The study of spiders has attracted the attention of a limited number of naturalists in Yorkshire during the past three hundred years, the rise and fall of interest within the county closely reflecting that in the country as a whole.

Martin Lister (1638–1712) produced his famous *Historae Animalium Angliae Tres Tractatus* (1678) under the auspices of The Royal Society while practising medicine in the City of York. In the course of this treatise, Lister described thirty-two species of spider — one assumes many of them were Yorkshire specimens — and such is the detail of his descriptions that it is possible to assign them to present-day species with considerable certainty. Lister concludes his account by stating: 'I do not want anyone to think that I have described absolutely all the species, but I make bold to say that no one can find casually in this country any species not described by me.'

R. H. Meade (1814–1899) was the first Yorkshire arachnologist of any significance after Lister, and in the meantime Linneus' nomenclature had been widely adopted for the separation of different species. Meade, who was a surgeon in Bradford, was particularly interested in diptera and arachnida, and was one of the few people to work closely with John Blackwall (1788–1881) who described no fewer than 304 species of British spider. Meade himself undertook a private publication which listed 231 British species, but there is little to indicate which of them were recorded in Yorkshire.

O. Pickard-Cambridge (1828–1917) was the doyen of British arachnologists for many decades; in 1907 he contributed a section in The Victoria History of Yorkshire which recorded 219 Yorkshire species (compared with a total of 532 British species in 1900). Being a Dorset man, Pickard-Cambridge had to rely extensively on Yorkshire collectors to produce his list, and he was lucky to have an up-and-coming young teacher, William Falconer, to provide him with most of his information.

William Falconer (1862–1943) was a schoolmaster in the village of Slaithwaite, near Huddersfield, for all his working life; he joined the YNU in 1909, and was elected its President in 1927 after he had retired to Liverpool. His main interests were botanical and all arachnid orders. Such was his ability to communicate his enthusiasm to others that large numbers of arachnologists sprang up in many parts of Yorkshire, and their collected data were summarized by Falconer and published in *The Naturalist* 1918–22. Stainforth in VC 61, Walsh, Heslop-Harrison and Britten in VC 62, and Winter in VC 63 and VC 64 were his chief colleagues in helping to swell the Yorkshire total of species to 323.

The appearance of *British Spiders*, published by The Ray Society in two volumes (1951 and 1953) revolutionized the study of spiders in Britain by making it possible for the amateur and professional alike to identify every species to be found in Great Britain. The two authors, G. H. Locket and A. F. Millidge, obviously drew extensively on the published records of William Falconer, and to a lesser extent on the studies of A. A. D. La Touche, a Bradford doctor who visited habitats neglected by Falconer. More recent work in Yorkshire, particularly that directed by E. A. Duffey at Malham Tarn Field Centre, has led to the Yorkshire species total now standing at 383. This represents about 60 per cent of the British list.

Changes in the Yorkshire Arachnifauna During the Period 1940–80

In 1943, at the time of Falconer's death, little work on spiders was being undertaken in Yorkshire, but by 1980 a further sixty species had been added to the Yorkshire list. Since Falconer and his colleagues were such thorough and enthusiastic workers, it is of interest to

consider how so many species could remain unknown to him. The following table* summarizes changes in status for each of the main families of spider over the past forty years in Yorkshire.

TABLE 1

Major changes in Yorkshire Spider Records since 1940

	Increasing Species		*Decreasing Species*	
Family	*New species since 1940*	*Species showing marked increase*	*Not recorded since 1940*	*Species showing marked decrease*
DICTYNIDAE and OONOPIDAE	*L. humilis* (65) *A. patula* (80)	*L. humilis* (0–8) *O. domesticus* (1–8)	*D. latens* (36) *A. subnigra* (10)	*D. latens* (11–0)
GNAPHOSIDAE	*D. pubescens* (53) *Z. rusticus* (54) *Z. pusillus* (80)	*H. blackwalli* (7–16) *G. leporina* (1–7)		
CLUBIONIDAE	*C. norvegica* (48)		*C. virescens* (36) *S. celans* (18) *S. gracilipes* (15)	*C. erraticum* (8–1)
THOMISIDAE	*X. bifasciatus* (77) *P. fallax* (47) *P. histrio* (59) *T. maritimus* (53)	*X. lanio* (1–10) *X. ulmi* (1–8) *T. maritimus* (0–8)	*D. dorsata* (1866) *X. kochi* (32) *P. emarginatus* (36)	*X. kochi* (5–0) *O. praticola* (12–1) *P. emarginatus* (4–0)
SALTICIDAE		*S. cingulatus* (3–10) *H. flavipes* (2–8) *H. nivoyi* (1–7) *Eu. aequipes* (1–5)		*H. cupreus* (5–1)
LYCOSIDAE	*P. prativaga* (53) *X. miniata* (53) *A. cuneata* (75) *P. uliginosus* (75)	*P. agricola* (2–15) *P. purbeckensis* (3–11) *P. prativaga* (0–9) *P. hortensis* (1–4) *X. miniata* (0–6) *T. spinipalpis* (1–6) *P. uliginosus* (0–7)	*T. robusta* *A. cinerea*	*P. latitans* (6–2)
AGELENIDAE and MIMETIDAE	*A. labyrinthica* (69) *T. agrestis* (69)	*T. agrestis* (0–7) *E. cambridgei* (3–13)		*H. montana* (34–15) *H. nava* (4–1)
THERIDIIDAE	*E. flavomaculata* (78) *T. tinctum* (56) *T. bellicosum* (75)	*E. flavomaculata* (0–5) *T. tinctum* (0–5)	*A. tepidariorum* (35)	*A. tepidariorum* (15–0) *T. simile* (3–1) *R. neglectus* (12–3)

*Nomenclature according to *A Check List of British Spiders* part IV Vol. III of *British Spiders* by G. H. Locket, A. F. Millidge and P. Merrett, together with more recent additions and alterations contained in the Bulletin of The British Arachnological Society.

TABLE 1 *(continued)*

TETRA-GNATHIDAE	*T. striata* (46)			*P. listeri* (13–3)
ARANEIDAE	*A. gibbosus* (77) *A. marmoreus* (48) *A. sclopetarius* (70) *A. redii* (61) *A. adiantus* (65) *H. albovittata* (61)	*A. marmoreus* (0–10) *A. sclopetarius* (0–7) *A. redii* (0–4) *A. adiantus* (0–3) *H. albovittata* (0–3) *H. pygmaea* (1–8)	*A. alsine* (1891)	*A. sturmi* (15–3)
LINYPHIIDAE Erigoninae (TM IV present)	*W. melano-cephala* (61) *E. flavipes* (67) *E. omissa* (47) *P. parallela* (61) *P. mediocris* (60) *S. incurvatus* (46)	*W. melanocephala* (0-6) *W. nodosa* (1–13) *W. incisa* (1–4) *W. kochi* (9–18) *W. clavicornis* (1–7) *T. affinis* (4–18) *B. pratensis* (4–17) *H. jacksoni* (3–10) *P. parallela* (0–4)	*C. scabrosa* *W. capito* (13) *W. obtusa* (09) *H. florens* (09)	*C. scabrosa* (3–0) *W. dysderoides* (8–2) *M. penicillata* (14–5) *G. rubellum* (46–24) *P. nemoralis* (13–3)
Erigoninae (TM IV absent)	*C. stativa* (79) *E. capra* (61) *R. morulus* (65) *E. fausta* (46)	*M. castaneipes* (1–10) *A. crassiceps* (1–9) *R. morulus* (0–3) *E. fausta* (0–13) *E. caliginosa* (2–9)	*T. biovatus* *P. sulcifrons*	*T. biovatus* (5–0) *M. subaequalis* (6–2) *P. sulicfrons* (7–0) *L. dentichelis* (5–1) *C. distincta* (7–2)
Linyphiinae	*D. speciosa* (47) *H. nubigena* (47) *H. pervicax* (46) *O. melanopygius* (46) *P. campbelli* (46) *P. oblitum* (48) *A. ramosa* (61) *M. mollis* (69) *M. lepidus* (63) *O. vaginatus* (78) *C. persimilis* (46) *T. setosus* (60) *L. pinicola* (73) *L. expertus* (67) *P. phrygianus* (76)	*D. speciosa* (0–4) *H. nubigena* (0–7) *H. pervicax* (0–6) *O. melanopygius* (0–14) *P. campbelli* (0–4) *A. subtilis* (1–8) *A. ramosa* (0–3) *M. lepidus* (0–3) *O. vaginatus* (0–3) *T. setosus* (0–6) *L. pinicola* (0–4) *L. angulatus* (2–21) *L. expertus* (0–18) *P. phyrgianus* (0–17)	*S. innotabilis* (20) *S. gracilis* (05)	*H. reprobus* (7–2) *O. firmus* (7–1) *L. obscurus* (50–30)

Notes on the previous table:

Column I There are no significant changes in the families that have been omitted.

Column II The numbers in parentheses indicate the year in which the species was first recorded in Yorkshire. Thus, (65) implies 1965.

Column III The first number in parentheses indicates the number of records for that species in Yorkshire before 1940, and the second number is that of records after 1940.

Column IV The numbers in parentheses indicate the year in which the species was last recorded in Yorkshire. Thus, (36) implies (1936).

Column V As in column III.

It will be seen that twenty species on Falconer's list have not been recorded since 1940, including two rare species each taken on a single occasion in the nineteenth century. On the other hand, fifty-one species have been added to Falconer's list. This number does not include several species which have been subdivided by modern systematists: for example, the species known to Falconer as *Theridion denticulatum* (Walck.) is now recognized as two distinct species, *T. melanurum* Hahn and *T. mystaceum* L. Koch which exhibit minor morphological differences but which generally live in different biotopes.

Causes Underlying the Changes in the Yorkshire Arachnifauna

Apart from recording the changes summarized in the previous Table, the main purpose of this study is to suggest possible reasons for each changes.

A. Changing Techniques

The development of the modern binocular microscope, together with more effective lighting, make the study of morphological microstructure much easier, and this may partly account for many more arachnologists being able and willing to tackle the smaller members of such families as the Linyphiidae.

The rapid development of the science of ecology frequently involved a statistical element, and one such technique was the refinement of pitfall trapping. While making allowances for its considerable limitations — many species do not pass through a stage when they would normally be in a position to enter a trap — many species, particularly the nocturnal *Gnaphosidae* and the *Linyphiidae* that live in the decomposing plant remains of woods and heaths, as well as the *Lycosidae* during their mating and dispersal phases, enter pitfall traps freely. During the past ten years, a number of projects involving this technique have been employed by many workers in various parts of Yorkshire with outstanding results.

Other techniques such as Tullgren funnel extraction, water-traps and adhesive surfaces have been much more limited in their use and in producing results of any significance.

B. Changing Habitats

Perhaps the most significant change in the diversity of the Yorkshire countryside is the considerable afforestation that has been undertaken by both the Forestry Commission and private landowners. In particular, large areas of lowland and upland heath have been drained and planted with conifers. The large acreage of plantation in Yorkshire has resulted in the loss of many populations of wetland and upland spiders, but it has also led to the establishment of its own characteristic arachnifauna. *Lepthyphantes expunctus* (O.P. — Cambridge) was first recorded by John Murphy in the conifers near Malham Tarn in 1967, since when it has spread throughout the northern half of Yorkshire. In a similar manner, the species *Pityohyphantes phrygianus* (C. L. Koch) was first recorded in Scotland in 1974; two years later Lodhi found it among conifers in the Langdale Forest, and by 1977 it was well established in the conifer plantations on the North Yorkshire Moors. This year it has been taken in suitable habitats just south of York, and in the western parts of VC 64 and 65 (Fig 1).

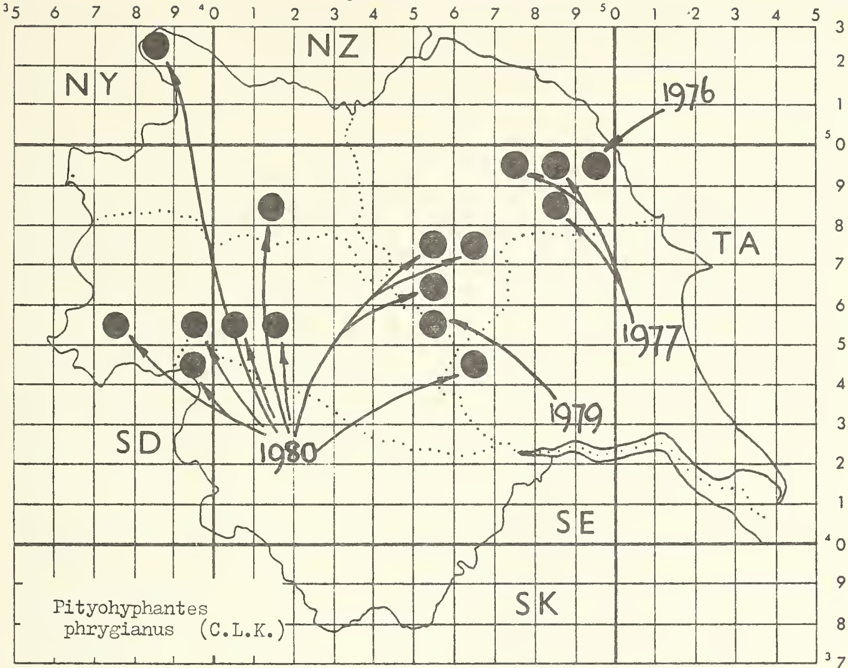

FIGURE 1

The spread of *Pityohyphantes phrygianus* (C.L.K.) since its first Yorkshire record in 1976.

The considerable and continuing loss of wetlands throughout Yorkshire has had no apparent effect on the variety of spiders in the county but this may be due to a number of factors, such as the apparent reluctance of arachnologists to study wetland spiders in the first half of the twentieth century, the fact that many important wetland sites still remain, the fact that most spiders are not very specific in their prey, and the fact that dispersal by gossamer allows a constant restocking of existing wetlands. In fact, many of the additions to the Yorkshire list since 1940 are wetland species: species such as *Entelecara omissa* O.P.-Cambridge are rare fenland species that have been recorded at Hornsea Mere (1947) and Askham Bog (1960) where they continue to flourish.

Recent records of *Baryphyma pratensis* (Blackwall) indicate a sudden expansion of a previously limited population. Prior to 1940, it had been recorded from four sites in the lower Ouse basin. In 1978 there were indications that it was spreading along the many tributaries of the Ouse system and in 1980 its presence was detected in most riverside sites that were investigated (Fig 2). Is the cause of this population explosion attributable to a change in the management of river banks? A similar unanswered question is: why were the pre-1940 records for *Walckenaera kochi* (O.P.-Cambridge) all from coastal regions while those since 1950 are entirely from riverside and swampy sites inland?

C. Introductions

The apparent introduction of *P. phrygianus* (C.L.K.) from the continent has already been mentioned. It is certain that *Ostearius melanopygius* (O.P.-Cambridge) was introduced to Britain, probably from New Zealand; la Touche recorded it first at Cottingley Bridge in

1946, since when it has been taken on thirteen occasions from sites all over Yorkshire. Some species survive in Yorkshire for short periods only, such as *Hasarius adansoni* (Audouin) which was well-established in the hot-houses at Pearson's Park, Hull in 1908. This spider is no longer retained on the British list, although Falconer regarded it as a Yorkshire species in his time.

D. Facilities

There is no doubt that facilities available to the naturalist to take up the study of spiders are much more favourable than ever before. The appearance of a reliable, comprehensive and well-illustrated book for the identification of all British species heralded a new era, and we were fortunate to have one of its co-authors directing the first course on spider identification at Malham Tarn Field Centre ever to be run by that organization. Subsequent courses at that centre, particularly those run by Dr Eric Duffey, have produced a well-documented arachnifauna for the Malham area.

Arising out of courses run at various Field Centres, the British Arachnological Society was founded and continues to provide bulletins, newsletters, a library and field courses for its members.

Putting aside for a moment the matter of expense, it is true to say that transport is easier for the modern arachnologist than it ever was for Falconer's generation. During the 1940s la Touche visited all parts of the county which were not readily accessible to Falconer and he

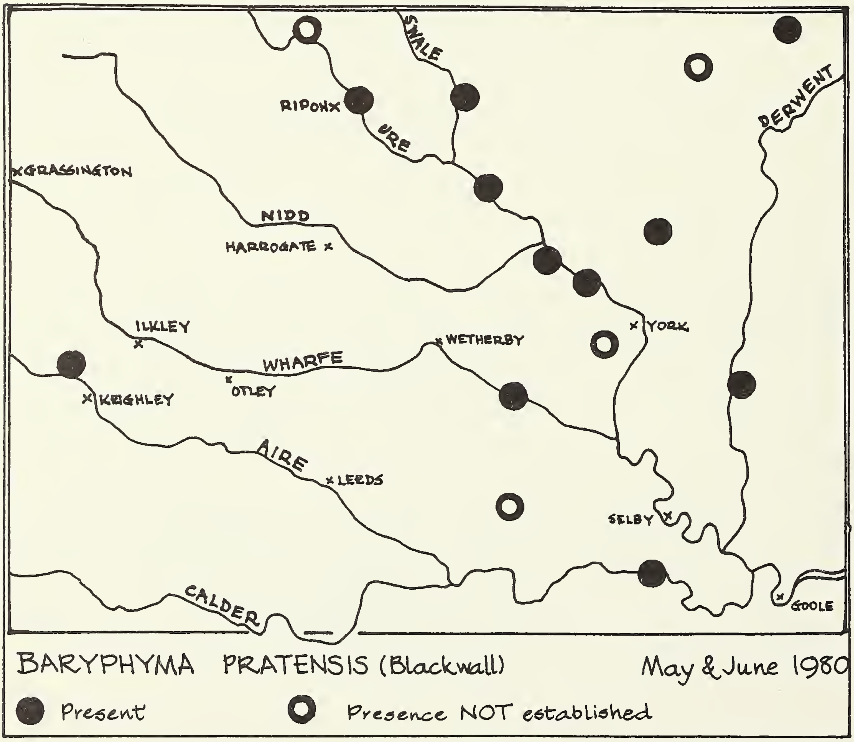

FIGURE 2
Records of *Baryphyma pratensis* (Bl.) during 1980.

was able to add over a dozen new species to the Yorkshire list in a very short time.

The foundation of the Yorkshire Naturalists' Trust in 1946 by the establishment of Yorkshire's first nature reserve at Askham Bog, has now resulted in over forty such reserves being created in the county. Apart from the Trust, Yorkshire reserves are administered by the Nature Conservancy Council, the Royal Society for the Protection of Birds, local authorities and private owners. The proper management for each of them relies on a comprehensive and thorough knowledge of its flora and fauna, of which the spiders form an integral part. The overall Management Plan for a nature reserve calls for a full knowledge of the spiders present, their numbers, habitat requirements and significance in the ecosystems present. The very presence of a nature reserve is a challenge to find out as much as possible about its natural content, and the arachnologist will automatically gravitate to such areas.

E. The Arachnologist

All disciplines attract men and women of particular temperaments and enthusiasms. The study of spiders is no exception. But on various counts, the number of people attracted to the study of spiders is bound to be comparatively small, and as a result the construction of a distribution map of a single species of spider in Yorkshire will often provide more information about the distribution of arachnologists than of the spider in question. An individual worker naturally devotes most study to the countryside near his home.

TABLE 2

Habitat	*New species since 1940*	*Increasing species since 1940*	*Decreasing species since 1940*
Lowland wetlands	16	5	4
Lowland heath	13	5	4
High ground (over 1500 ft.)	8	4	0
Trees, shrubs and vegetation	9*	2	6
Under stones, bark, etc	7	1	0
Coastal	5	0	3
Woodland litter	2	2	9

*Including four spp. on conifers.

Analysis of the changing pattern of spider records according to habitat preferences yields the information in Table 2. It is quite apparent that little work was done by Falconer's generation on the great lowland heaths at Strensall Common (not mentioned by Falconer and his contemporaries), Skipwith Common, Allerthorpe Common, Tilmire Pilmoor, and such areas in the Vale of York. Not until recently have collections been made on hills such as Pen-y-ghent, Whernside, Mickle Fell and many others; while much of the Yorkshire countryside in Swaledale, Teesdale and Wensleydale was visited only on the occasion of a YNU Excursion. The apparent decrease in the woodland litter species is really a decrease in the number of records, probably correlated with this type of habitat being less frequently searched than half a century ago.

Current Activity in Yorkshire

More work is being undertaken in Yorkshire today than for a long time, and this has largely been stimulated by the proposed production of an Atlas of Yorkshire Spiders which will hopefully appear in 1982. Many Yorkshire schools have collected specimens, particularly from parts of the county which are rarely visited by the collector, and these have been

identified and the data used for the preparation of maps. Wardens of RSPB and NCC Reserves have made collections from the areas in their charge, and the Management Committees of many of the YNT Reserves have acted similarly. Curators for the Natural Sciences in many Yorkshire museums have undertaken special projects in the areas served by their museum, partly in keeping with the current trend to get to know their own localities at least as well as making collections on a national or worldwide basis.

The help provided by these many sources is invaluable, but it still remains true that the bulk of progress at the present time lies with those who can identify specimens accurately and whose collecting can be directed by their own understanding of the finer points of the subject. At the time when this address is being delivered, it is gratifying to be able to say that in Yorkshire today we have more well-qualified arachnologists than ever before. Most of them have followed up an initial enthusiasm by attending a BAS Field Course at one of the nationwide Field Centres, and once started there is no stopping them.

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A SURVEY OF THE SCUTTLE FLIES (DIPTERA: PHORIDAE) OF UPLAND HABITATS IN NORTHERN ENGLAND

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Two of us (JCC and JB) surveyed a series of peat and upland habitats in the north of England as part of a study to characterize the invertebrate fauna of peatlands for the Nature Conservancy Council. The major invertebrate groups were investigated, primarily by pitfall trapping at a large series of sites across the north of England, ranging in altitude from lowland oligotrophic mires near sea-level to the ridge of the northern Pennines on Great Dunn Fell (847 m).

Although not specifically included in the groups studied in the survey, over 7000 individual Phoridae were obtained and the material relating to this difficult taxonomic group was sent to one of us (RHLD) for determination. As a result of this investigation at least forty-three species were found and a preliminary picture was obtained of the distribution of several species of phorids which inhabit upland areas. The extent of the survey allowed generalizations to be formed concerning the environmental factors influencing the distribution of some phorids as well as information concerning their biology and life-cycles.

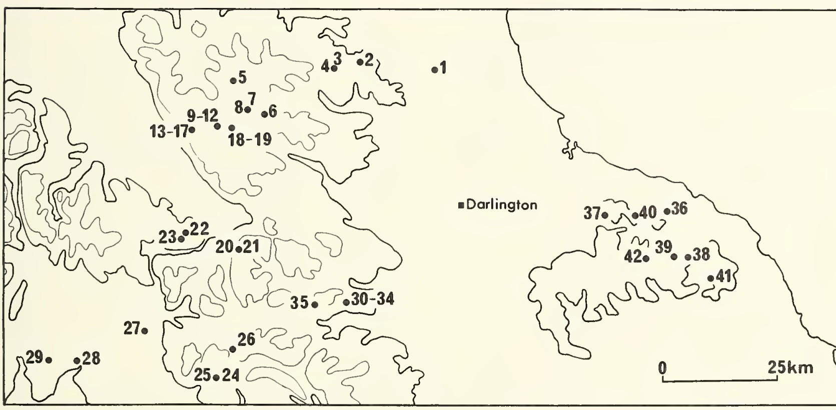

FIGURE 1
Study sites in Yorkshire, Co. Durham and Cumbria (see Table 1).

Methods

The investigation started with the selection of forty-two typical peatland or upland grassland sites distributed across the north of England in Yorkshire, Co. Durham and Cumbria. Eight upland grassland sites on mineral soils were selected in close proximity to eight of the peatland sites to enable comparisons to be made between the faunas on the two soil types. The peat sites ranged from deep blanket peat to dry heath where the peat layer is less than 100 mm in depth. Lowland oligotrophic mires were included to extend the altitude range of the peat sites but no low altitude mineral soil sites were investigated. The sites studied are listed in Table 1 and their distribution is shown in Fig 1.

TABLE 1

List of the sites used in the survey with National Grid references and environmental parameters. Site names in italics denote sites on mineral soils, all others are on peat.

Site	Grid ref.	Altitude (m)	Rainfall** (mm)	Peat depth (mm)	Vegetation dominants	No. of species	Total specimens
Main sites used in 1977/78							
1. Bearpark	NZ 252442	91	670	500	Grasses	13	182
2. North Plantation	NZ 083455	274	840	80	Calluna	8	211
3. Waskerley A	NZ 016447	411	950	70	Calluna	8	253
4. Waskerley B	NZ 014446	411	950	1500	Calluna/ Eriophorum*	7	147
5. Kilhope	NY 800432	627	1480	60	Eriophorum	8	208
6. Langdon Common	NY 863349	625	1510	1000	Eriophorum	6	54
7. *Grass Common A*	NY 827357	674	1700	0	Grasses	7	122
8. Grass Common B	NY 825357	674	1700	1000	Calluna/ Eriophorum	6	50
9. *Moor House A*	NY 755332	533	2050	0	Grasses	6	70
10. *Moor House B*	NY 756328	561	2050	0	Grasses	18	488
11. Moor House C	NY 764332	549	2000	1000	Juncus squarrosus	5	82
12. Moor House D	NY 765333	551	2010	1000	Calluna/ Eriophorum	8	72
13. Great Dun Fell 430 m	NY 697295	427	1400	60	Juncus squarrosus	10	114
14. Great Dun Fell 520 m	NY 702298	518	1500	300	Juncus squarrosus	6	63
15. Great Dun Fell 580 m	NY 708302	579	1650	550	Juncus squarrosus	9	239
16. *Great Dun Fell* 630 m	NY 713307	625	1700	0	Grasses	17	446
17. Great Dun Fell 820 m	NY 711319	823	1900	120	Eriophorum	8	212
18. Cow Green A	NY 814302	500	1750	500	Calluna/ Eriophorum	9	111
19. *Cow Green B*	NY 814303	500	1750	0	Grasses	11	236
20. *Tailbridge A*	NY 810042	518	1500	0	Grasses	13	548
21. Tailbridge B	NY 811043	518	1500	1500	Eriophorum	6	49
22. *Sunbiggin A*	NY 687090	335	1420	0	Grasses	12	194
23. Sunbiggin B	NY 680083	274	1420	100	Calluna	7	145
24. Scar Close A	SD 755779	336	1700	340	Calluna/ Eriophorum	9	42
25. *Scar Close B*	SD 754780	336	1700	0	Grasses	10	202
26. Newby Head Moss	SD 795836	427	1950	460	Juncus squarrosus	10	122
27. Burns Beck Moss	SD 595880	168	1600	1000	Calluna/ Eriophorum	9	32

TABLE 1 *(continued)*

28. Meathop Moss	SD 445818	11	1150	1000	Calluna	5	71
29. Deer Dyke Moss	SD 343823	15	1380	1000	Calluna	6	66
30. Golden Groves	SE 044945	457	1100	250	Calluna	9	162
31. *Apedale A*	SE 022943	388	1180	0	Grasses	11	131
32. Apedale B	SE 023944	396	1180	60	Calluna	5	154
†33. Rowantree Scar A	SE 032932	411	1050	60	Juncus squarrosus	12	191
†34. Rowantree Scar B	SE 032932	411	1050	100	Calluna	8	95
35. Beldon Bottom	SD 967940	488	1500	1000	Calluna/ Eriophorum	4	99
36. Tranmire	NZ 762117	213	910	100	Calluna	7	79
37. Kildale	NZ 620111	274	880	80	Calluna	7	69
38. Murk Mire	NZ 797025	240	780	1000	Juncus effusus/ Calluna	8	197
39. Yarlsey	NZ 750007	305	1020	130	Calluna	6	68
40. Job Cross	NZ 692110	259	910	1000	Calluna	9	76
41. Fen Bog	SE 852974	198	880	1000	Calluna/ Eriophorum	8	46
42. Botton Cross	NZ 701017	427	900	1000	Eriophorum	6	28
Additional sites used in 1978							
43. Grass Common B extra	NY 825358	674	1700	1000	Calluna/ Eriophorum	5	63
44. Moor House D extra	NY 765332	551	2010	1000	Calluna/ Eriophorum	5	36
45 *Tailbridge A extra*	NY 810043	518	1500	0	Grasses	3	18
46. Tailbridge B extra	NY 811042	518	1500	1500	Eriophorum	1	2
47. *Great Dun Fell top*	NY 712322	847	0	0	Grasses	7	454
48. Dun Fell Saddle	NY 708328	780	0	1000	Eriophorum	4	77
49. *Little Dun Fell top*	NY 705330	842	0	0	Grasses	8	245
Additional site used in 1976 only							
50. Moor House E	NY 758335	553	2050	200	Juncus squarrosus	6	20

*Eriophorum is in all cases *Eriophorum vaginatum*
**Estimates supplied by the Meteorological Office
†Based on five traps

At all sites, with the exception of Rowantree Scar, ten pitfall traps were used. Each trap had a mouth diameter of 45 mm except at Moor House and on Great Dun Fell in 1976 where jars with a 50 mm diameter were used. All traps were emptied at monthly intervals in April, May, September, and October and at fortnightly intervals in June, July and August. Trapping started at most sites between May and July 1976 and continued through the severest drought of the century to February 1977. Because of the exceptional weather conditions, the phorids were examined during a further year of trapping, from April to November 1978 at the same sites plus additional sites also listed in Table 1.

On emptying each trap, the jar was filled to a depth of about 20 mm with a water-detergent mixture to which a small quantity of formalin was added to aid preservation of material. The detergent lowered the surface tension of the water and prevented insects which had entered the trap from escaping.

Species List

The list of the forty-three species recorded in this survey is given below. Against each species name, the site number from Table 1 is given for each locality from which the species has been recorded. The site numbers for areas on mineral soils are given in italics. Many of the species have been collected previously in emergence traps set over soil (Disney, 1978, 1979c, 1980c; Disney and Szadziewski, 1979; Jones, 1976a, b; Varley, unpublished data). These are marked with an asterisk below. Other larval habits are noted in the text.

Anevrina thoracica (Meigen).* 4, *9*, *10*, 12, 13, 26, 27, 40.
Fourteen in 1976 and only 5 in 1978. They were obtained in June — 2, July — 6, August — 3, and September — 3. Hackman (1963) recorded numbers in vole burrows in Finland from May to August with peak numbers in May and June/July. Pupae recorded in mole nests (Malloch, 1908; Lundbeck, 1922).

Anevrina urbana (Meigen)* *10*, 23, 24, 50
Two ♂♂ in 1976 and 4 ♂♂ in 1978 in March — 1, May — 3, and June — 2. Pupae recorded in mole nests (Malloch, 1908; Lundbeck, 1922), and adults in vole burrows (Hackman, 1963; Baumann, 1977) and at the corpse of a coot at Malham Tarn on 27 April 1980 by one of us (RHLD).

Citrago citreiformis (Becker) *10*, *16*
One in 1976 and 13 in 1978 (only 2 ♂♂); all in September except 1 in October. Nelson (1971) recorded it at Moor House in September. Elsewhere adults recorded in August and September (Schmitz, 1949).

Conicera floricola Schmitz* 24, 25, 40
C. miniscula Schmitz has recently been synonymized with *C. floricola* (Disney, 1980b). One in August 1976 and 3 in June and July 1978. It has been reared from a mole's nest (Schmitz, 1953), recorded in numbers in vole burrows and other cavities in the soil (e.g. Hackman, 1963; Baumann, 1977), caught at rodent droppings and meat bait (Hackman, 1963), and at dung (Skidmore, 1978).

Conicera tibialis Schmitz *49*
One ♀ in August 1978. This is the 'Coffin fly' that breeds in coffined human corpses and other, usually buried, carcases (Schmitz, 1953; Colyer, 1954a, c, d).

Diplonevra concinna (Meigen)* *10*, 23
One in August 1976 and 1 in August and 1 in September 1978. Recorded in a wasp nest (Spradbery, 1973), and reared once from fungi (Schmitz, 1949). Nelson (1971) recorded it at Moor House in July and August. Puparia collected 9 June 1965 (by Nelson) in alluvial turf at Troutbeck Flats, Moor House (site 9 in this study) gave rise to adults on 31 July 1965.

Diplonevra funebris (Meigen) 1, 2, *7*, *9*, *10*, 13–*20*, 25, 26, 30, *31*, 33, *49*, 50
Sixty-eight in 1976 and 31 in 1978. In 1976 the phenology was June — 1, August — 21 and September — 46. In 1978 it was June — 3, July — 18, August — 6, and September — 4. In a survey of Tow Hill, North Yorkshire in 1976, using two water traps (Disney, 1979a), 83 specimens were obtained as follows: June — 4, July — 2, August — 76, September — 1. It would seem that the July peak observed in 1978 had no counterpart in 1976, probably because of

the extreme drought. The 1976 peak in August/September was not observed in 1978, and may, therefore, by an atypical phenomenon resulting from the drought earlier in the year. It has been reared from wasp nests (Collart, 1933; Collin, 1939; Macdonald *et al.*, 1975). Schmitz (1949) suggested it breeds in the remains of dead insects in the wasp nests. Aldrich (1892) reared it from (? moribund) sawfly pupae (*Cimbex americana* Leach). We have a female reared (by J. P. Dear) from a dead snail (*Helix aspersa* Muller) in Kent.

Diplonevra nitidula (Meigen)* *31*
Two ♀♀ and 13 ♂♂ in November 1976 to February 1977. Females have been observed swarming over a dead earthworm (Disney, 1979a).

Diplonevra pilosella Schmitz* 12, 33
One in August 1976 and 1 November 1976 to February 1977. Colyer (1950) reported this species reared from a wounded earthworm.

Gymnophra healeyae Disney 1, 3, 14, 26, 33
This species has long been confused with *G. quartomollis* Schmitz and has only recently (Disney, 1980d) been distinguished from the latter. Six ♂♂ and 6 ♀♀ in September 1976. In 1978, 22 ♂♂ and 10 ♀♀ were collected, 27 in July and 5 in August.

Megaselia aequalis (Wood)* 1
One ♂ in September 1978. The larvae feed on the eggs of slugs (Robinson and Foote, 1968).

Megaselia angelicae (Wood) 14, *19*, *20*, *22*
One in September and 1 in October 1976, 1 in November 1976 to February 1977, 8 in June and July, 1 in September, and 1 in October 1978. Larval habits unknown.

Megaselia angustifrons (Wood) 29
One ♂ in August 1978. Larval habits unknown.

Megaselia brevicostalis (Wood)* all except sites, 6, 35, 41, 42
Ninety-five were collected in 1976 and early 1977 and 107 in 1978, with the two sexes being equally represented. The phenology in 1976 was May — 1.2%, June — 2.5%, July — 3.8%, August — 28.8%, September — 51.3%, October — 1.2%, and November — 11.2%. In 1978 it was April — 0.9%, June — 2.8%, July — 7.4%, August — 11.2%, September — 25.2%, October — 46%, and November — 6.5%. Thus in the drought year the peak came earlier than in 1978. It is known to breed in dead snails (Lundbeck, 1922; Beaver, 1972; Disney, 1979b). Edwards (1929) reared this species from live *Tipula* larvae from soil. Although it has been suggested (Disney, 1979b) that caution is in order regarding the the correctness of the identification it is noteworthy that in the present survey the species was common at several sites devoid of snails.

Megaselia ciliata (Zetterstedt)* *16*, 18, *20*, *22*, 24
Eleven in 1976 (8 in August and 3 in September), 1 November 1976 to February 1977 and 6 in 1978 (4 in August and 2 in October). Nelson (1971) recorded it at Moor House. The larvae feed on slug eggs (Disney, 1977b, 1979b).

Megaselia dahli (Becker) 6, *10*, *47*
One ♀ in July and 1 ♂, 1 ♀ in August 1978. Larval habits unknown.

Megaselia diversa (Wood) 38
One ♂ in September 1976. It has been reared from the nest of a blackbird (Colyer, unpublished notebooks). Robinson (1971) cites records of adults in bird nests.

Megaselia flavicoxa (Zetterstedt) 3–6, 8, 9–12, *16*, 18, *19*, 24–6, 30–5, 38, 41, 42, 44, 50
Fifty-seven in 1976 and 163 in 1978. Only 17 specimens were females. The phenology in 1976 was July — 5.3%, August 80.7%, and September — 14.0%; in 1978 it was July — 1.8%, August — 34.6%, and September — 63.6%. As with *M. brevicostalis* the peak came earlier in the drought year than in 1978. Nelson (1971) recorded it at Moor House in August. The larvae parasitise larvae of the sciarid *Bradysia bicolor* (Meigen) (Disney, 1976). Hackman (1963) recorded it only in burrows of voles also inhabited by *B. bicolor* adults. The capture dates given by Schmitz (1956) suggest two periods of adult emergence in the year, but only the second is evident in the survey results.

Megaselia giraudii (Egger) 2–5, 15–17, *20*, 21, *22*, 26, 29
Eleven in 1976 and 10 in 1978. Phenology was June — 12, July — 1, August — 4, September — 3, and October — 1. The larvae are highly polyphagous, ranging from moribund insects to dog dung (Robinson, 1971; Disney, 1979b).

Megaselia hirticaudata (Wood) *22*
Fifty-nine ♀♀ and 22 ♂♂ were collected at Sunbiggin limestone site only. Phenology was September 1976 — 24, February 1977 — 1, June 1978 — 17, July 1978 — 19, August/early September 1978 — 20. Larval habits unknown.

Megaselia longicostalis (Wood) every site
This species was collected at every site. Eight-hundred-and-sixty-five in 1976, 130 in January and February 1977, and 3540 in 1978. It is the one British phorid that is best sampled by pitfall traps, probably because the females tend to have abbreviated wings, and the species is characteristic of the litter layer (e.g. Disney, 1977a; Disney and Davies, 1979). Nelson (1971) recorded it at Moor House. The phenology for those caught in 1976 and 1978 is presented in Table 2 as the monthly totals expressed as a percentage of the catch for the year. The sites have been grouped into three altitude bands. Inspection of the 1978 figures for lowland sites shows a May — July generation and a September — November generation. At upland sites the earlier generation is shifted to June — August and there is no obvious later generation. Inspection of the 1976 figures suggests that at lowland sites the earlier generation was disturbed by the drought, giving rise to a delayed peak in September, with the later generation being delayed until November. At higher levels the start of the June/July peak is comparable with 1978 but then falls to be followed by a September peak. The presence of 130 specimens between November 1976 and February 1977 suggests there may be an overwintering population of adults. Herbert and Braun (1958) recorded adults hibernating under moss in winter. Overall the males tended to outnumber the females (about 1.3:1), with this tendency being more marked from September onwards. This species is known to frequent carrion (Wood, 1912; Lundbeck, 1922) and Schmitz (1938) reared it by exposing meat to gravid females.

Megaselia meconicera (Speiser) 21
One ♂ in September 1976. Larval habits unknown.

Megaselia pectoralis (Wood) 1, 2, *16*, *22*, 25, 26, 27
Two ♂♂ in 1976, 10 ♂♂ and 1 ♀ in 1978. Phenology was May — 2, June — 4, July — 3, August — 2, September — 1, and November — 1. Larval habits unknown.

Megaselia pleuralis (Wood)* All localities except 28
One-hundred-and-thirty-three in 1976, 2 in February 1977, 1133 in 1978. There were 523 ♀♀ and 745 ♂♂. The contrast in the totals for 1976 and 1978 strongly suggests the 1976 drought severely reduced the population. The phenology is presented in Table 3. The contrast between the 1976 pattern and the total pattern for 1978 suggests the drought shifted the normal June/July peak to July/August. The 1978 figures show a sharp peak in June at lower altitudes but a broader peak in June/July at higher altitudes, with the actual peak coming in

TABLE 2

The phenology of *Megaselia longicostalis* in 1976 and 1978 at different altitudes (expressed as percentages of total catch for the year at altitudes indicated)

Year	Altitude (m)	April	May	June	July	August	September	October	November	Total
1976	< 300	0	0	9.3	2.7	2.6	30.7	0	54.7	75
1976	301–600	0	1.6	10.8	9.8	14.2	46.6	6.1	10.9	671
1976	601–900	0	5.0	21.0	17.7	9.3	36.1	6.7	4.2	119
1978	< 300	4.8	13.9	14.9	14.2	3.8	7.6	28.1	12.7	395
1978	301–600	0.2	5.0	19.6	26.4	14.2	15.4	13.2	6.0	1797
1978	601–900	0.1	1.1	21.4	42.6	24.3	5.3	5.2	0	1348

TABLE 3

The phenology of *Megaselia pleuralis* in 1976 and 1978 at different altitudes expressed as percentages of total catch for the year at the altitude indicated; except the total figures for 1978 are the means of percentages of the constituent three sets of figures)

Year	Altitude (m)	April	May	June	July	August	September	October	November	Total
1976	< 900	0	1.5	6.8	44.3	15.8	23.3	1.5	6.8	133
1978	< 300	0	1.1	48.5	12.2	0.3	20.0	17.9	0	369
1978	301–600	0	0	31.8	41.8	2.6	8.0	8.2	7.6	622
1978	601–900	0	0	23.9	43.0	4.2	16.9	12.0	0	142
1978	< 900	0	0.4	36.3	32.3	2.0	13.1	11.8	4.1	1133

July at these higher altitudes. At lower altitudes there is clearly a second generation in September/October. At higher altitudes this is less marked. At intermediate altitudes this second generation is drawn out over three months (September/October/November) instead of two. It has been reared from the nest of a mole (Colyer, cited Disney, 1978), found in numbers in vole burrows (Hackman, 1963; Baumann, 1977), reared from a rotten willow log (Edwards, 1925) and a freshly emerged adult found in a rotten birch log (Disney, 1979b). The larval habits are still unknown.

Megaselia propinqua (Wood) 1, 34
One ♀ in October and 1 in November 1978. Larval habits unknown.

Megaselia protarsalis Schmitz. 41
One ♂ in September 1978. Larval habits unknown.

Megaselia pulicaria (Fallen)* All localities
The recognition of this somewhat variable species has caused problems, but recently this situation has been clarified (Disney, 1980a) if not finally resolved. One of us (RHLD) would welcome specimens caught *in copula*, or reared series, in order to further advance knowledge of the variation in this species. Specimens should be preserved in fluid (e.g. 70% alcohol). One-hundred-and-thirty-eight were collected in 1976 and early 1977, 240 in 1978. There were 156 ♀♀ and 222 ♂♂. Nelson (1971) recorded it at Moor House. The numbers are not sufficient to reveal any significant difference in the phenology at different altitudes. The overall phenology in 1976 was April — 0%, May — 5.1%, June — 27.9%, July — 18.4%, August — 20.6%, September — 12.5%, October — 8.1%, November — 7.4%. In 1978 the pattern was April — 0.8%, May — 18.7%, June — 31.7%, July — 24.2%, August — 6.7%, September — 3.3%, October — 14.2%, November — 0.4%. The latter figures suggest two principal periods of emergence in May — July, and October. In 1976 it appears the first peak was delayed by the drought and tended to overlap with the second peak, which was also somewhat prolonged into November. Two specimens in February 1977 support the observation that adults will overwinter (Aston, 1957; Herbert and Braun, 1958). The larvae feed on the eggs of spiders (Evans, 1969; Disney and Evans, 1980), and have also been recorded breeding in fungi (Lundbeck, 1922; Disney, 1980a), in larvae and pupae of Lepidoptera, wasp nests, dung (Lundbeck, 1922), and dead snails (Disney and Evans, unpublished data). It seems, however, that spider eggs are the preferred diet of the larvae.

Megaselia pumila (Meigen) 1, 3, 5, 8, *10*, *16*, 17, *19*, 22, 25, 27, 30, *31*, 34, 36–40, *47*
Thirteen were collected in 1976 and 37 in 1978. There were 24 ♀♀ and 26 ♂♂. The phenology in 1976 was June — 2, July — 1, August — 1, September — 2, October — 2, November — 5. In 1978 it was April — 1, May — 4, June — 14, July — 5, August — 1, September — 5, October — 5, November — 2. The latter figures suggest two principal periods of emergence, in May — July and in September — November. Nelson (1971) recorded it at Moor House. Colyer (1954b) reared it from an Agaric fungus.

Megaselia ruficornis (Meigen)* 25
One ♂ in July 1978. The larvae appear to be polyphagous, with a preference for dead molluscs (Robinson, 1971).

Megaselia sepulchralis (Lundbeck) *47*, *49*
Four ♂♂ and 3 ♀♀ in June 1978. Nelson (1971) recorded it at Moor House in April. The larval habits are not known but Lundbeck (1922) collected numbers on tree stumps, especially exuding stumps of *Acer*.

Megaselia sordida (Zetterstedt) *10*, 15, *16*, *31*, *47*, 48
Two ♀♀ in August 1976, and 6 ♀♀ and 6 ♂♂ in 1978 (4 in July, 7 in August, 1 in September). Nelson (1971) recorded it at Moor House in July. The larval habits are not known.

Megaselia stigmatica (Schmitz) *16, 22*
One ♀ in July 1976 and 1 ♂ in June 1978. The males of this species are highly distinctive and yet it has only recently been added to the British List on the basis of a specimen from Windsor Great Park (Disney, 1977c). Since then one of us (RHLD) has collected it in Wiltshire, Dr I. F. G. McLean has sent us specimens from Norwich and Dr A. G. Irwin has sent specimens from Huntingdon. The larval habits are not known.

Megaselia vernalis (Wood) 40
One ♂ in June 1978. Larval habits unknown.

Megaselia woodi (Lundbeck) *10, 16, 19*, 27
One ♂ in November 1976. One ♂, 1 ♀ in September and 2 ♂♂ in October 1978. Nelson (1971) recorded it at Moor House in September. Malloch (1906) recorded adults on decaying fungi. Larval habits unknown.

Megaselia spp.
Seventeen specimens cannot be identified as yet. In most cases they are females in groups where the taxonomy of the males only is understood. At least seven species are represented and at least one appears to be new to science. It is hoped to sort out these specimens when good comparative material of related species is available.

Metopina galeata (Haliday)* 7, 30, 33
Three ♂♂ and 1 ♀ in September 1976. Larval habits unknown.

Metopina ologoneura (Mik)* 6, *9, 10*, 18, *19*, 37, 41, 42
Three ♂♂ and 3 ♀♀ in 1976 (June — 1, August — 1, September — 3, November — 1). One ♀ in July and 1 ♀ in August 1978. Adults were reported in numbers in vole burrows by Baumann (1977). Larval habits unknown.

Phora atra (Meigen) 28
Phora aterrima (Fabricius) has recently been synonymised with *P. atra* (Smith, 1980). Three ♂♂ ad 1 ♀ in July 1978. Larval habits unknown.

Phora stictica Meigen *10, 16*, 30
One ♀ and 1 ♂ in August 1976, 2 ♂♂ in September 1978. Nelson (1971) recorded this species at Moor House. Larval habits unknown.

Triphleba distinguenda (Strobl) *20*
One ♂ in June 1978. The species is associated with carrion (Schmitz, 1938, 1943).

Triphleba gracilis (Wood) 3, 11, 12, 18, 33, 43, 44
One ♀ and 10 ♂♂ in 1978 (5 in September, 5 in October, 1 in November). Nelson (1971) recorded it at Moor House in September. The larval habits are not known, but puparia have been found under the bark of rotting logs of conifers (Disney, 1979b).

Triphleba intermedia (Malloch) *20*
Two ♀♀ in May/June 1978. Nelson (1971) recorded it at Moor House. Larval habits unknown.

Triphleba nudipalpis (Becker)* 1, 2, *10*, 12, 13, 15, *16*, 17, 18, *20*, *22*, 23, 28, 33, 34, 37, 39, 42, *47, 49*
Eight collected in 1976 as follows: May — 1, August — 1, September — 2, November — 4. Thirteen collected November 1976 to February 1977, 44 collected in 1978 as follows: May — 2, June — 4, July — 6, August — 6, September — 3, October — 22, November — 1. In all there were 32 ♀♀ and 33 ♂♂. Schmitz (1943) states that it overwinters in the pupal stage and probably has three generations in the year. The relatively large number caught overwinter

between November 1976 and February 1977 contradicts Schmitz's view of the overwintering stage and there appears to be only two generations. The May to August collections presumably represent the first generation. Elsewhere, emergence traps set from 12 May to end of July produced 8 in May, 15 in June and 33 in July (Disney and Gunn, 1980). The September to February collections presumably represent the second generation.

Colyer (cited in Disney, 1979a) reports this species reared from a dead earthworm and from sewage.

Triphleba trinervis (Becker) *31*
One ♂ November 1976 to February 1977. Wood (1906) recorded adults visiting carrion and rotting fungi in the autumn. The larval habits are not known.

Discussion

The invertebrate fauna of the Moor House National Nature Reserve was surveyed over a five-year period (1963–67) by sweep-netting and trapping (Nelson, 1971). In the present study nine sites on the Reserve were used over two years (Moor House and Great Dun Fell sites); and a further four were used in one year only, but only two of the sites were close to those used by Nelson. Nelson recorded seventeen species of phorids but also remarked that only a small proportion of the catch had been identified. It is not clear how selective he was in the identification, although ten out of seventeen of the identified species were members of the genus *Megaselia*. He commented that phorids were more frequently encountered on the mineral grasslands than on the peat soils. In the present survey we recorded twenty-seven species from the Moor House National Nature Reserve, with fifteen of these in the genus *Megaselia*. We encountered thirteen of the species identified by Nelson. The other fourteen species were new records for the Reserve.

The captures made during the present survey can be compared with those made in two white water-traps at Tow Hill Nature Reserve, in the Yorkshire Pennines, in 1976 (Disney, 1979a). A total of twenty-one species were caught in the two traps and *Megaselia longicostalis* only represented 1.1 per cent of the specimens. By contrast, in the present survey more than 60 per cent of the specimens belonged to *M. longicostalis* and no site produced any total approaching twenty-one species. Surveys of the Malham Tarn Nature Reserve (situated between 350 and 450 m in the Yorkshire Pennines) have so far produced more than eighty identified species and a number of species whose identity is still uncertain (Disney, unpublished data). The indications are that a minimum of 100 species probably occur on Malham Moor. The site, however, embraces a much larger area and a richer diversity of habitat types than any site in the present survey.

Some of the observed differences are probably due to the sampling techniques used. Experiments show that pitfall traps are not as effective as water traps for surveying phorids (although they have advantages for other groups). However, pitfalls would appear to be a particularly useful tool for the investigation of the population dynamics of *M. longicostalis*.

The nature of the bias in pitfall trapping for phorids is such that comparative differences between sites and years are likely to be genuine. For example the greater number of phorid species recorded per site on mineral grasslands than on peats is likely to be real and confirms Nelson's conclusion using different sampling methods. Similarly, the wide altitudinal range of most phorids and the frequency with which the same species occur commonly on peat and mineral soils are genuine results and contrast with other groups of Diptera, e.g. Tipulidae and Dolichopodidae which have been simultaneously investigated using the same traps.

The fauna of peat and mineral soils have several major differences (Coulson and Whittaker, 1978). In particular, earthworms, snails and moles are almost completely absent from peat soils, which make up the majority of the sites covered in this investigation. Several phorids occur in localities where their known larval habitat or food is absent. The most marked example is the abundant *Megaselia brevicostalis* which is known to breed in dead snails. This species was collected from over thirty of the forty-two sites but at only six of these have we found snails, and all six of these were on mineral soils. Edwards (1929) suggests that

this species parasitizes *Tipula* larvae and a similar extension of larval requirements must apply to *Anevrina thoracica*, *A. urbana* and *Diplonevra pilosella*. In contrast, two species whose larvae feed on slug eggs, *Megaselia aequalis* and *M. ciliata*, were taken at one and five sites respectively although slugs were found at almost every site.

Sciarids are exceedingly abundant on many of the peatland sites and there is a good agreement between these observations and the distribution of *M. flavicoxa*, the larvae of which parasitize sciarid larvae. Likewise, spiders, particularly Linyphiidae, are also abundant in upland areas and *M. pulicaria* whose larvae feed mainly on spiders' eggs, was found at all sites.

It is clear that many phorids, including those found in this investigation, have a very limited distribution, resulting in the majority of species being taken at only a few trapping sites. Altitude and the differences between peat and mineral soils are relatively unimportant in determining the distribution of phorids and only in some cases is there a good agreement between the known larval habitat and food source and the distribution of the fly. There is need for much more detailed work on the biology of the phorids before a clear understanding of their habitat requirements is obtained.

Conclusions

The extent of the material from forty-two main sites and several other stations where trapping was carried out in one year allows a number of conclusions to be drawn concerning the distribution and abundance of the Phoridae in upland areas and on peatlands. These are:

1. No species of phorid collected during this survey was restricted to high altitudes. This suggests that there are no truly Arctic or sub-Arctic phorids in upland areas of northern England. This is in contrast to some other groups of Diptera. However, there are some phorids that have an extensive geographical range which penetrates into the Arctic. These have a 'northern' distribution but also occur at low altitudes in Britain. We do not yet know enough of the distribution of phorid species in Britain to be able to make more detailed comments.
2. Only four out of the forty-three species recorded in this survey were found at most sites. These are *Megaselia brevicostalis*, *M. pleuralis*, *M. pulicaria*, and *M. longicostalis*. *M. flavicoxa* was also found at the majority of sites, but was less frequently encountered on the North York Moors and was only recorded in two out of the thirteen sites below 336 m.
3. A high proportion of the species (twenty-six out of forty-three) was recorded at less than four sites. The rarity of these species cannot be attributed solely to the catching method since in several species, e.g. *Diplonevra nitidula*, *Megaselia angelicae*, *M. hirticaudata* the species were represented by several specimens at each site.
4. There is no correlation between the number of species at a site and altitude ($r = +0.13$). This is again in contrast to some other groups of Diptera, such as the Tipulidae, where the number of species increases markedly with altitude.
5. There is virtually no change in the phorid community on peat soils at high and low altitude. Few of the species found appear to be limited in their distribution by the lower temperatures encountered at higher altitudes.
6. Few of the phorid species showed a marked habitat separation between mineral and peat soils. Only three species, *Diplonevra funebris*, *Megaselia sordida* and *M. woodi*, showed a strong attraction to mineral soils or an avoidance of peat. Similarly, only *Megaselia giraudii* and *Triphleba gracilis* showed a marked preference for peat and avoided mineral soils, but both species are known from other habitats.
7. Nevertheless, more phorid species were found on the mineral sites than on the peat sites. This difference is clearly shown by comparison of the eight pairs of sites on peat and mineral soils. In all eight cases, more phorid species were recorded on the mineral grassland sites with mean of 11.0 species on the mineral soils, and 6.9 on the peats (difference 4.1 ± 1.2, $t = 3.4$, $p < 0.05$).
8. The study of other invertebrate groups on the forty-two main sites resulted in the recognition of six communities. The number of species of phorid per site in each of the communities was as follows:

(i)	Lowland, oligotrophic mires	6.25 species (standard error ± 0.63)
(ii)	High altitude blanket bog	6.71 ± 0.52
(iii)	Mixed wet and dry moor	7.29 ± 0.58
(iv)	Dry, heath-like moor	6.88 ± 0.52
(v)	Areas with both peat and mineral affinities	9.20 ± 1.32
(vi)	Mineral grasslands	10.43 ± 1.31

There is a marked similarity in numbers of species (and species composition) between the four peat communities (i–iv) and the greater number of species on upland grasslands is also evident in areas with a mineral influence (v).

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BOOK REVIEWS

100 Families of Flowering Plants by **M. Hickey** and **C. J. King**. Pp. xx + 568, with 135 figures. Cambridge University Press. 1981. Hardback £27.50; Paperback £8.95.

The diversity of floral structure within the Angiosperms is very wide. As an aid for students in comprehending this range in floral morphology numerous books have illustrated and described the floral details of representative families of flowering plants. The present work is reasonably comprehensive since it includes a number of the more important families not represented as natives in the British flora. In addition to the series of drawings showing dissections of the floral parts of each type portrayed along with the accompanying captions, there are also accounts of the floral characteristics of each family together with its distribution, chief economic and ornamental species and an outline classification with enumeration of the principal genera and the numbers of species they contain. An illustrated introductory sketch covering floral structure and a glossary complete this sound and useful guide: the pity is that the teaching of systematic botany to the level catered for by this book is now neglected in all save three or four British universities.

WAS

The Observer's Book of Cacti and other Succulents by the late **S. H. Scott**, and revised by **J. W. P. Mullard.** 185 pages, illustrated in colour. Frederick Warne Ltd. 1981. £1.80.

The Observer's Books manage to keep reasonably up to date without losing their distinctive approach and format, and at the same time the price does not run ahead of inflation. This one first appeared twenty years ago and was certainly due for revision. It now has entirely new illustrations made from excellent colour photographs, and the unpretentious text is about equally divided between Cactaceae, 'other succulents' and introductory matter on morphology and methods of cultivation. It can be thoroughly recommended as a beginner's book to anyone interested in these fascinating plants.

FHB

STEPHEN ROBSON'S *HORTUS SICCUS*

PETER DAVIS

The Hancock Museum, Barras Bridge, Newcastle upon Tyne

ABSTRACT

Stephen Robson (1741–79), the Quaker botanist of Darlington, Co. Durham, is well known as the author of *The British Flora* published in 1777. A number of letters and manuscripts survive today with the family's descendants which refer to the publication of the Flora, but perhaps more surprising is the survival of Stephen Robson's collection of dried plants in three bound folio volumes — his *Hortus Siccus*. This paper examines the collection and its compiler. Particular reference is made to the survival of the *Hortus Siccus* during the 200 years it remained in the possession of the Robson family.

STEPHEN ROBSON AND *THE BRITISH FLORA*

Accounts of the life and work of Stephen Robson have been given by Smith (1878), Britten and Boulger (1893), Boulger (1897), Baker (1903), Green (1917), Henrey (1975), and Desmond (1977).

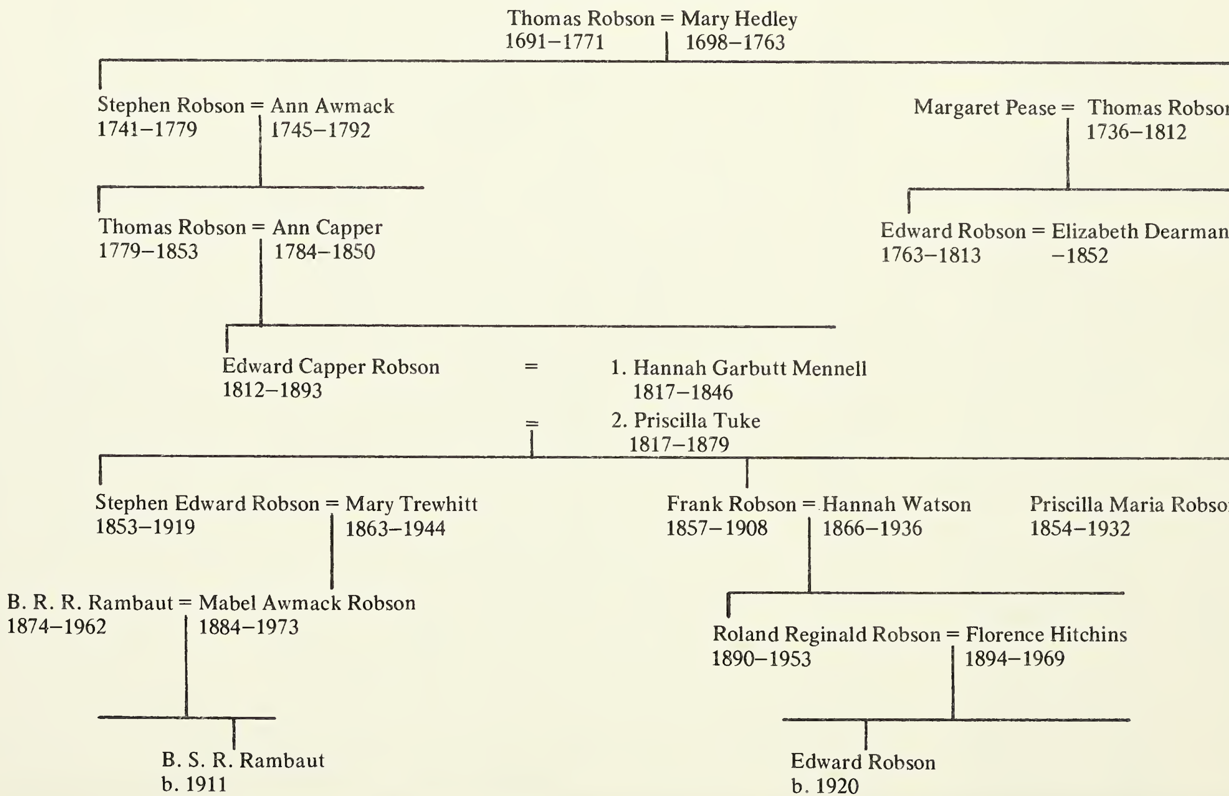
Stephen Robson was born on 13 June 1741 in Darlington, Co. Durham. His father, Thomas Robson (1691–1771) had become a Quaker in 1717, and Stephen received a basic education as was common among the Friends at that time. He developed an early interest in the natural sciences, particularly botany and astronomy, and taught himself Latin and Greek in order to pursue his interests. When his father died, Stephen Robson succeeded to the family linen-weaving business in Northgate, Darlington, the premises including a small house and shop from where he also conducted a grocery business.

Stephen Robson's interest in botany probably dates from his late teens. He was evidently competent by 1763, when he corresponded with Robert Harrison (1715–1802), a mathematician and linguist of Newcastle upon Tyne, about obtaining plant specimens. Harrison was a close friend of Stephen Robson throughout his life and gave a great deal of help in the preparation of *The British Flora* for which he is credited in the preface of the work. The correspondence between Robson and Harrison is quoted by Green (1917), and the letters themselves still survive with a family descendant, Edward Robson, of Market Weighton, York. Davis (1980) describes how these manuscripts and the *Hortus Siccus* were located, and the subsequent discovery of the original manuscript of *The British Flora* with another family descendant, Stephen Rambaut of Beverley, North Humberside.

Green (1917) and Henrey (1975) have described at length the origins, publication and finances of *The British Flora*. The original prospectus is dated 1 March 1776, and the first copies of the publication were received by Robson in September 1777 from the printer, William Blanchard of York. The published price of *The British Flora* was 4/6d. to subscribers and 5s. to non-subscribers. However, in spite of the reasonable price, the book was never to prove particularly popular, and Robson wrote to his friend, Rev. Richard Hill Waring (1716–1794), on 15 December 1778 to say that there would be no second edition because the sale of his work had fallen short of expectation. The letter is quoted in full by Green (1917). There can be little doubt, however, that the *Flora* was a significant contribution to botanical literature, being the first British Flora written in English in which binomial nomenclature is used. As Smith (1878) states — '(The British Flora) . . . published when the enthusiastic author was only 36 years of age and closely confined to the counter, was, however, no mean attempt for one entirely self taught both as regards the classic languages and science, and reflects great credit upon his proficiency, and the good purpose of which this was applied'.

Some confusion has existed until recently regarding the authorship of a rare plant list for Durham — *Plantae rariores agro dunelmensi indigenae* — credited to Stephen Robson in

The Descendants of Thomas Robson of Darlington



most recent bibliographical literature. However, Davis and Graham (in press) have shown that this list was printed privately for circulation by Stephen Robson's nephew, Edward Robson (1763–1813). He was one of the original Associates of the Linnean Society of London, a correspondent of J. E. Smith (1759–1828) and contributed various descriptions to *English Botany*. His 'Supplement to the British Flora', a manuscript dated 1790 which updates his uncle's work is in the Botany Library of the British Museum (Natural History). A shorter manuscript referring to *Ribes spicatum* and rare Durham plants is currently in the possession of the Darlington and Teesdale Naturalists Field Club.

Origins of the *Hortus Siccus*

Stephen Robson was greatly encouraged by his friend Robert Harrison to pursue the study of botany. Evidently the two men exchanged plant specimens, as Harrison's letter to Robson on 1 October 1763 testifies:

Frd. [Friend] Stephen,

> I have sent thee as many seeds of the Balsamine [*sic*] lutea as I have been able to save this bad season, and must beg the favour of thee to procure and send me p[er] Pickersgill [the carrier] a good quantity of the roots of White Bryony; I would be also glad . . .[part of letter missing] a specimen of the yellow poppy, Carduus maria [nus], Astragalus luteus, (roots or seeds) or any other rarity thou hast met with abt. Darnton [Darlington].
>
> I am
> Thy obliged Friend
> R. Harrison

This exchange of seeds and roots to propagate in their respective gardens continued. In a further letter dated 25 August 1764 Harrison writes:

Frd. [Friend] Stephen,

> I recd. the books etc. p[er] carrier. Thy fears were but too true abt. the C. marianus / what I had from thee proves C. nutans / I have collected some seeds of it this summer at Tinmouth [Tynemouth] where it grows plentifully. I found a nettle too amongst the plants that came from thee which I took for the U. urens, and accordingly rooted it up — if it was the *pilulifera* I must beg a fresh supply. The Stellaria is alsine longifolia uliginosis proveniens locis R. Syn. 347. J.B. aquatica media C.B. (Caulam habit quadrangularum infirmum, . . . [indecipherable] foliorum). This is included under S. (graminea) foliis linearibus intergerrimis floribus paniculatis Lin. S.P. who supposes it (I imagine) a variety arising from the place of growth. C. Intzbus I have met with several times in this country; particularly this summer I took up some roots at Hartley—pans with intention to plant them here, but unfortunately left them at Blyth. It is at present called by Lin. C. caulis simplici ramoso, floribus consertis, omnibus sessilibus. I am particularly obliged to thee for the flower of the Utricularia, which . . . [this part of the letter missing].
>
> I find Salicaria lutea in my garden, which I suppose came from thee; pray where was it found? and should it not be Monadelphia in the sexual system? Is it Salarea [? Salvia] or Horminum that grows, on the outside, under the wall of Houghton Church-yard! Thou mayst easily collect some roots and seeds of Menianthes; I would be glad try [*sic*] to propagate them.

An appended note dated 12 October continues . . .

> I wish thou couldst also procure me some roots of the Solidago virgaurea — I have seen it on Crossbridge and imagine there must plenty thereabouts on the banks of the Tees — I would have a good quantity if it may be got conveniently. I have enclosed a few seeds for thee to nurse, but shall leave it to thyself to impose names on them when they are come to perfection. Please to give Frd. Rchd. [Richard Lindley] the glasses with my best respects and send the parcels to Mr. Emerson.
>
> from
> Thy sincere Friend
> R. Harrison

This exchange of specimens and botanical information was to prove vital to the success of the *Flora*. Harrison's superior education helped resolve a number of problems which Stephen faced with terminology, and his circle of correspondents must soon have learnt of Robson's botanical interests. Harrison was in contact with many leading naturalists of the time, some eager to capitalize on a new source of specimens — as his letter to Stephen Robson on 3 November 1770 indicates:

> Friend Stephen,
>
> I have sent thee on the other side a list of English Plants which I received from Doctor Hope, Professor of Botany at Edinbro', of which he would be glad to have seeds or dried specimens. If any of them fall in thy way I doubt not but as a lover of the science thou will be glad to oblige him. I got something last spring for the root of the Monarda but it has never appeared above ground. I must therefore beg thou will get it supplied for me either from Mr. Ornsby's or Mr. Dent's garden behind his house. Have I nothing I ought to send thee?
>
> I am
> Thy Sincere Friend
> R. Harrison.

A list of 107 plants arranged in four columns follows. It is interesting to note that this is the first reference to dried plants, all previous exchanges referring to seeds or roots for propagation. The Doctor Hope mentioned in the letter was John Hope (1725–1786), Professor of Botany and Regius Keeper in Edinburgh, 1761.

Stephen Robson was to realize the importance of herbarium specimens when corresponding with William Curtis (1746–1799). In a letter to Curtis dated 25 November 1771 (quoted by Curtis (1941)) he writes:

> Esteemed Friend
>
> Thy very acceptable favour came to hand, and agreeably to thy proposal I send thee a catalogue of the plants growing in this neighbourhood, including some British plants which we have in gardens, or which I think I can procure in their respective seasons . . . [several species of grasses] . . . The names are taken from Linnaeus's *Species Plantarum*. I am afraid this catalogue will not answer thy expectation, as our country produces but few uncommon plants: we have no mountains, few woods or marshes . . . I am sorry that I have not been in the practice of preserving specimens, but hope from thy example and instructions to be more careful in that respect for the future. I am with grateful acknowledgement of the favours received from thee.
>
> Thy real friend
> Stephen Robson

Undoubtedly this instruction from one of the most respected botanists of the day to preserve plants had a marked effect on the young Robson, as only a year later the vast majority of the specimens in his *Hortus Siccus* had been collected, preserved, bound and indexed. Prior to Curtis's influence Robson seemed content to exchange seed and cultivate

his botanic garden, perhaps due to Harrison, of whom Robson himself, in the letter to Richard Hill Waring on 15 December 1778 says 'R. Harrison, tho' a great naturalist, is not, as far as I ever could find, a great collector'. This long botanical letter is quoted in full by Green (1917), but ends with a reference to gum arabic, used in preparing his plant specimens for the herbarium:

> I use Gum Arabic. I have no method of keeping the gum water in a fluid state. I keep it in a pot, where it soon hardens, and when I intend to use it, pour a little water on it, at the same time laying the brush which has been used for the purpose before in water to soften, and both are fit for use the next morning. I have heard that gum water may be kept fluid in a bottle closely corked, but my method is so easy that I don't think it necessary to seek for any other.
>
> I am Thy Frd.
> Stephen Robson

From the sudden burst of activity in 1771 and 1772, the number of specimens added to the collection declines rapidly, although Robson continued to add specimens up to the year of his death, 1779.

SURVIVAL OF THE *HORTUS SICCUS*

It seems probable that Stephen Robson's collection passed to his son, Thomas Robson (1779–1853), who established a drapery business in High Street, Sunderland. He married Ann Capper (1784–1850) in 1803, and their son, Edward Capper Robson (1812–1893) was to take possession of the *Hortus Siccus* and the many manuscripts written by his grandfather. Smith (1878), notes 'we are gratified to learn that his Hortus Siccus, comprised in 3 folio volumes and dated 1772, is yet in existence and carefully preserved by his grandson, in addition to the MS of his *British Flora*, and many other volumes of manuscript extracts etc., all of which are executed in a remarkably neat and legible caligraphy'.

Green (1917) quotes a letter written by Edward Capper Robson to him in 1884 which states:

'I have many MSS of my grandfather, chiefly botanical — the MS copy of the *Flora* — three folio volumes of his dried plants, and many letters written to him from his friends and his publishers, but his signature is scarce with me'.

Britten and Boulger (1893) repeat that: 'MS of 'Flora', letters and herbarium in possession of his grandson, Edward Capper Robson of Sunderland'.

There is some confusion as to the fate of the plant collection following Edward Capper Robson's death in 1893. Writing in 1897, G. S. Boulger states: 'The original manuscript (of the Flora), together with the author's Hortus Siccus, in three folio volumes, is still preserved by his descendants'. Baker (1903) confirms that 'The manuscript of his flora and his herbarium in three folio volumes, were lately in the possession of his descendants', whilst Green (1917) states that 'Stephen Robson's Hortus Siccus in three folio volumes, dates 1772, is in possession of his great grandson Stephen Edward Robson of Moorhill, Sunderland; we fear many of his books and manuscripts, so greatly treasured by his erudite grandson the late Edward Capper Robson of Sunderland, have been dispersed since his death, unhappily the lot of most family collections'.

Stephen Edward Robson (1859–1919) was one of five children from Edward Capper Robson's second marriage, to Priscilla Tuke of York in 1852. Although Green (1917) states that Stephen Edward held the plant collection, it seems that his elder sister, Priscilla Maria Robson (1854–1919) was the more likely owner. In a bound copy of *The British Flora* presently owned by Mr Edward Robson of Market Weighton, there is a note in Priscilla Maria's handwriting, saying 'to Frank Robson with Stephen Robson's Hortus Siccus — September 1906'. Frank Robson (1857–1908) was her younger brother.

It seems that it is at this point that the two major Robson heirlooms — the original MS of the Flora and the Hortus Siccus — parted company after more than one hundred years. S. E.

Robson certainly possessed the MS of the Flora, which passed to his daughter Mabel Awmack (1884–1973) who married Major Bertrand R. R. Rambaut (1874–1953). Their son, B. Stephen R. Rambaut (b. 1911) of Beverley, is its current owner.

Frank Robson's wife,, Hannah Isabella Watson (1866–1936), inherited the Hortus Siccus. Writing to her son, Roland Reginald Robson (1890–1953) from Harrogate in March 1924 she says:

> I am giving you 'Robson's Flora'. You are the only one who understands it and I think I may say you will be the only one who will know what to do with it.

It would seem that the plant collection was becoming something of an embarrassment, and it is likely that it was around this time that the collection suffered from poor storage conditions, causing severe damage.

Roland Robson passed on the collection to his son Mr Edward Robson of Market Weighton, the current owner.

It is interesting to note that Kent (1957) says of the *Hortus Siccus*: 'formerly in possession of family. Not traced'. Desmond (1977) mentions that York Museum has plants collected by Stephen Robson, but these have not yet been found.

The *Horticus Siccus*

Although the survival of Stephen Robson's plant collection is notable, the collection itself is something of a disappointment, as none of the specimens have accompanying data. This is somewhat surprising considering the meticulous care shown by Robson in his preparation of the *Flora*, and in the effort expended in collecting and preparing specimens for his herbarium. Had notes on place and date of collection been added, undoubtedly many of his specimens would now be considered as first records for Durham and North Yorkshire.

The three volumes of the *Hortus Siccus* (each measuring 21 × 35 cm) were rebound in 1853 by Edward Capper Robson, although the original titles on the spine have been re-used. E. C. Robson obviously treasured his grandfather's collection, and a number of pencilled notes throughout the collection verify this; it was also Capper Robson who was responsible for conservation work on the collection, including the use of gummed paper strips to re-fix some of the specimens.

There is no logical sequence followed in the plant collection, althogh an attempt has been made to group together species from one genus. Volume 1, dated 1772–73 contains 320 species of flowering plants, which are listed by Robson. These are of interest, as they indicate the Latin and common names in use at the end of the eighteenth century; for example, *Paris quadrifolia* is known by the names 'True-love' and 'One-berry'. Volume 1 also has a page index to the common names of the plants present. Against specimen number 26 a pencilled note (by E. Capper Robson) reads 'The *R. spicatum* was first put here for *R. alpinum*'. This is a reference to a plant described by Edward Robson in the Linnean Society Transactions in 1794, which he names *Ribes spicatum*. In the Edward Robson manuscript in the possession of the Darlington and Teesdale Naturalists Field Club, which also describes *Ribes spicatum*, E. Robson writes (in 1794): 'The specimen from whence the Figure was made, as also the dried ones, were taken from a tree which was brought from the neighbourhood of Richmond in Yorkshire some years ago to my late uncle Stephen Robson who planted it in his garden where it remained for several years and took it for the R. alpinum; the circumstances of the upright spike of flowers most probably led him into that mistake as it answers the specific character given by Linné in his Species Plantarum . . .' A further pencilled note adjacent to specimen number 102, *Montia fontana* reads, 'Shafto Crags, ECR, 6.8.72' indicating that Edward Capper Robson has also replaced certain specimens.

Volume 2 has no heading to the plant list, but simply continues the 1772/3 listing. The 340 specimens in this volume include not only flowering plants, but also ferns, mosses, lichens, fungi, and marine algae. There is no common name index in this volume, and only one pencilled note referring to the loss of certain specimens of grasses from the collection.

Volume 3 has been compiled from 1774 to 1778, where Stephen Robson has evidently attempted to fill the gaps in his collection. Flowering plants, ferns and lycopods are present

in this volume, 142 specimens being added in 1774, 60 in 1775, 11 in 1776, 12 in 1777, and 19 in 1778, a total of 244 specimens.

There is an interesting addition to the back of Volume 3 — three specimens of bark cloth brought from Otaheite by Sydney Parkinson in 1769, with a neat handwritten note by Stephen Robson describing the mode of manufacture.

Three specimens of plants have been added on certain sheets *(Gentiana verna, Hermannia althaefolia, Ranunculus aquatilis)*, probably by Edward Capper Robson.

Unfortunately the overall condition of the specimens is poor. In extreme cases complete specimens have been destroyed and the majority show at least some sign of insect attack. But the principal reason must lie with poor conditions of storage, exacerbated by the use of gum arabic (a ready food for small insects), and the fact that the sheets have been bound, which makes their examination difficult and even damaging. The collection has now been cleaned and fumigated, and this should ensure its survival for a time longer.

ACKNOWLEDGEMENTS

I am indebted to Stephen Rambaut of Beverley and Edward Robson of Market Weighton not only for allowing me to borrow original Robson manuscripts and the *Hortus Siccus*, but for their patience in supplying information about their botanical family.

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FIELD NOTE

Trogulus tricarinatus (L.), a harvestman (Opiliones) found for the first time in northern England

A single immature specimen of *Trogulus tricarinatus* was found under a stone beneath hazel bushes in scrub on limestone at Bastow Wood, Upper Wharfedale at an altitude of 230 m on 17th June 1980. The individual was purple in colour, naked (i.e. without a covering of soil particles as in the adult) and its movement was slow and steady. This species has previous records from south of a line from the Bristol Channel to the Thames estuary, chiefly from chalky districts (Sankey and Savory, 1974. *British Harvestmen*, Academic Press). I am grateful to J. Sankey for confirming the identity of the specimen.

D. Horsfield

BOOK REVIEWS

Seaweeds and their Uses by **V. J. Chapman** and **D. J. Chapman**. Pp. x + 334, including many tables and line drawings. Chapman and Hall. 1980. 3rd edition. £17.50.
An updated account of the many commercial uses of seaweeds throughout the world; substantial revisions to all sections have been made since the second edition, published in 1970. This fascinating aspect of these plants is all too often neglected on the school or university syllabus. The authors provide a most readable text, which contains a broad spectrum of reference material, including an impressive bibliography of more than 1450 titles; even this is incomplete, as the authors state that 'the literature is not so extensive that it is not possible to provide a complete bibliography'.

Desmids of the English Lake District by **Edna M. Lind** and **Alan J. Brook**. Pp. 123, including 171 figures. Scientific Publication No. 42, Freshwater Biological Association (The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP). 1980. £3.50.
Concise descriptions, supported by clear line drawings (by Joanna Langhorne, D. Williamson and A. J. Brook), of those species and varieties found in three or more of the tarns and lakes of the Lake District. Keys to genera and species, introductory matter, glossary, references, and index increase the value of this identification guide, which will also prove useful in other upland areas of the British Isles.

The Mushroom Hunter's Field Guide by **Alexander H. Smith** and **Nancy Smith Weber**. Pp. iv + 316, with full-colour illustrations. University of Michigan Press, Ann Arbor. 1980. $14.95.
New and enlarged edition (the last one was published in 1963) of this excellent guide to North American fungi. Keys and beautiful, explicit colour plates (most indicating both pileus and gill structure), as well as text descriptions (on identification, spores, edibility, habitat, etc), are provided for 282 species. Numerous plates and descriptions will prove helpful in identifying European fungi, but it will only be useful as a field manual in North America.

Quaternary Palaeoecology by **H. J. B. Birks** and **Hilary H. Birks**. Pp. viii + 289, including many figures and table. Edward Arnold. 1980. £28.
John and Hilary Birks' book will undoubtedly provide the standard text on the methodology involved in obtaining, and the interpretation of, data derived from Quaternary fossils and sedimentary deposits. The treatise comprehensively covers environmental reconstruction from such records, using a wide range of organisms to interpret past climates, vegetation cover, topographical features, impact of man, etc: plant macrofossils, diatoms, Cladocera, Mollusca, Coleoptera, and Vertebrata are treated, but a major part of the book is devoted, as indeed it should be, to pollen analysis. This work is strongly recommended to libraries, and a paperback version with a price more suitable to the undergraduate's pocket would most certainly be welcomed.

Nickel in the Environment edited by **Jerome O. Nriagu**. Pp. xiv + 833, including numerous figures and tables. Wiley, New York and Chichester. 1980. £34.75.
The latest in a series of volumes of major importance to biologists and environmentalists, under the competent editorship of Jerome Nriagu. Previous titles, having the same editor, have covered sulphur, copper, zinc, and cadmium in the Wiley Interscience Series, and lead and mercury in the Elsevier Topics in Environmental Health Series.

The present volume comprehensively treats (in twenty-nine chapters by forty-four authors) the chemical properties; ore deposits; economic uses; distribution and cycling in air, water, soil and ecosystems; accumulation and role in a wide range of biota; and toxic and deficiency effects, especially in respect of man.

The text provides both fundamental reading and a wealth of source material, and is strongly recommended for reference libraries.

BRITISH RECORDS OF THE NORTHERN WILLOW TIT

MARTIN LIMBERT

Museum and Art Gallery, Doncaster

The Yorkshire Specimen of 1975

On the South Yorkshire portion of Thorne Moors on 8 February 1975, C. D. R. Heard flushed an odd-looking titmouse from a patch of Bracken *(Pteridium aquilinum)*, and obtained a clear view when it perched in a nearby bush. The bird most closely resembled a Willow Tit *(Parus montanus)* and uttered a call very similar to the contact/feeding note of British Willow Tits *P. m. kleinschmidti*. However, it was unlike the latter race in several respects. The upperparts were pale grey (quite different from the warm brown of *kleinschmidti*), and the pale wing panel was not only distinct and well defined, but strikingly white — far more so than in native birds. The underparts and flanks were pale grey-cream, with little (if any) of the buffish coloration typical of British specimens. The cheeks — a clear pure white — contrasted with the duller breast colour. The bird looked relatively large, seemingly midway in size between Great Tit *(P. major)* and Willow Tit, and had a surprisingly long tail, of the same proportion to the body as that of a Great Tit.

The conclusion drawn was that the titmouse showed characters of the northern race of Willow Tit *P. m. borealis*. It has been accepted as such by the *British Birds* Rarities Committee (Rogers 1979), and is included in a study of the Thorne Moors avifauna (Limbert *et al.*, in press).

Other Confirmed/Unconfirmed Records

British Willow Tits belong to the resident, endemic race *kleinschmidti* and to date the only other race recognized in Britain is *borealis* (B.O.U. 1971). Until the Yorkshire occurrence of 1975, there had been only two confirmed British records of Willow Tits showing the characters of the latter race. The first involved one shot by J. H. Paddock at Tetbury (Gloucestershire) in March 1907 (Ogilvie-Grant 1908, 1908a). The specimen, a female, was presented to the British Museum (Nat. Hist.) where it remains (registered number 1908. 10. 25. 6). D. W. Snow (pers. comm.) notes: 'It seems to be a perfectly typical specimen of *P. m. borealis* though not quite as pale as some'.

More recently, one was seen on 15 and 16 September 1974 in Tree Lupins *(Lupinus arboreus)* near the sluice at Minsmere (Suffolk) by H. E. Axell and P. J. Makepiece. HEA (pers. comm.) observed the noticeably white cheeks and underparts, grey mantle and wings, and flanks with only a hint of buff. The bird was larger than British Willow Tits, frequently uttered the familiar 'tchay' note, and was very active. HEA and PJM had been catching locally breeding Willow Tits and Marsh Tits *P. palustris* for some years, and this bird, even in the field, was clearly different. The former was also able to draw on his experience of Willow Tits in central and south-western Europe, and Black-capped Chickadee *(P. atricapillus)* in North America, to comment: 'None was quite like this Minsmere bird, though the chickadee had the same bright white face and larger size, also the paler wing which the Minsmere bird had'.

On two further occasions, details have been published of possible sightings of *borealis*. Ogilvie-Grant (1908, 1908a) reported a group of titmice at Welwyn (Hertfordshire) on 12 January 1908 which he believed were of this race (published then as Northern Marsh-Tit *P. borealis*). His attention was first drawn to them by their 'Linnet-like song, composed of a number of broken, ascending notes'. Of the four or five individuals present, two sang the song described. Ogilvie-Grant commented on three features of the birds: flanks as pale as the breast, pale upperparts and white cheeks.

A second possible record of *borealis* was documented by Waterston (1937), involving Fair Isle's only Willow Tit. The bird, which appeared on 3rd November 1935, was accompanied by three Blue Tits *(P. caeruleus)* showing characters of the Continental-type race. Although

not examined in the hand, the 'outstanding feature' of this Willow Tit was the pure white of the cheeks and the sides of the neck. Both the Hertfordshire and Fair Isle records were quoted by Witherby *et al.* (1938) without commitment.

Range and Migration

The range of *borealis* extends from Norway/Sweden (to 70 degrees N.), the south-eastern Baltic and the eastern Carpathians westwards into the Soviet Union, as far as north-west Siberia. Although most populations are resident, those in the north of the breeding range migrate southwards in winter. The only vagrancy in this race known to Vaurie (1959) was the English record of 1907.

Acknowledgements

I would like to thank H. E. Axell and C. D. R. Heard for allowing me to publish details of their records.

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YNU BRYOLOGICAL SECTION: ANNUAL REPORT 1980

T. L. BLOCKEEL

The death of George Shaw further depletes the Bryological Section, and the county is now left with few active workers. George had an extensive knowledge of the literature of the county and he knew most of the sites for the rarer species of the Dales. This knowledge will be greatly missed.

In addition to the usual reports, notes have appeared in the *Naturalist* on William Sutcliffe of Heptonstall (Blockeel, 1980), and on the distribution of *Thuidium recognitum* (Shaw, 1980). This year's Sectional meetings were held at Denholme (VC 63) in May and in the Kilburn area (VC 62) in September.

J. H. Payne Herbarium

With the kind permission of Mr P. Skidmore of Doncaster Museum, I have been able to examine the collection of the bryologist J. H. Payne, who collected in South Yorkshire *c*1918–1928. Unfortunately, almost all the packets are of the commoner species, and some are misnamed. In particular, no vouchers were found to support the published records of *Scleropodium cespitans* and *Pottia starkeana sens. strict.* (Payne, 1928). A few of the gatherings are referred to in the records below.

RECORDS

My own work has again been largely in VC 63, with further interesting results. The vice-county is now relatively well recorded, but some gaps remain to be filled. Unless stated otherwise, the records below are my own.

Anthoceros agrestis (= *A. punctatus* auct.): (63*) 43/48 Arable field, Harthill Reservoir, Sept 1980.

Riccia warnstorfii: (63*) 43/48 Arable field, Harthill Reservoir, Sept 1980.

Metzgeria conjugata: (63) 43/59 Edlington Wood, J. Verhees, Aug 1971, (Doncaster Museum).

Trichocolea tomentella: (63) 34/94 Wet ground in rough pasture, Scald Bank, Kelbrook, nr Earby, Feb 1980.

Lepidozia cupressina (= *L. pinnata*): (63*) 34/93 Millstone grit boulder, Hardcastle Crags, Aug 1980. An oceanic species which is a notable addition to the flora of the Hebden Valley — the only previous record for the vice-county (Idle Woods) was made in 1857.

Lepidozia sylvatica: (63*) 34/93 Boulders, Highgreenwood, Hebden Valley, Oct 1978; (64) 44/25 Birk Crag, Harrogate, in packet of L. trichoclados, W. H. Burrell, 35.7.33 (Leeds Univ).

Calypogeia integristipula (= *C. neesiana* var *meylanii*): (62) 45/80 Near Mallyan Spout, YNU Exc, July 1979.

Plectocolea obovata: (63) 34/93 Hardcastle Crags, May 1978 — previously reported as *P. paroica* (Annual Report, 1978), but since redetermined by Mrs J. A. Paton; 44/04 Sutton Clough, Glusburn, Oct 1979.

Lophozia incisa: (63) 43/19 Wet rocks, Upper Derwent Valley, May 1980.

Mylia taylori: (63) 34/93 Boulders, Upper Worth Valley, May 1980.

Plagiochila britannica: (63*) 34/95 Broughton Hall, YNU Exc, Apr 1978 — reported at the time (Blockeel, 1978) as *P. asplenioides* var *major*, but since found to belong to this recently described species; 43/59 Edlington Wood, May 1980; (64*) 34/88 Limestone Rocks, Oughtershaw, YNU Exc, July 1980.

Nowellia curvifolia: (63) 34/94 Logs, Park Gill Woods, Carleton, Feb 1980.

Cephalozia connivens: (63) 44/60 Hatfield Moor, Dec 1979.

Cladopodiella fluitans: (63) 34/94 Peat bog, Raygate Hill, Carleton, Feb 1980.

Porella cordaeana: (64) 34/88 Oughtershaw, A. Norris, Sept 1980.

Lejeunea cavifolia: (63) 34/94 Park Gill Woods, Carleton, Feb 1980; Catlow Gill, Carleton, Apr 1980.

Lejeunea lamacerina: (63) 34/94 Park Gill Woods, Carleton, Feb 1980.

Sphagnum balticum: (63) 44/71 Refound on Thorne Waste, Jan 1980.

Pogonatum aloides: (63) Sandall Beat, J. H. Payne, 13.4.18 (Doncaster Museum) — Payne (1928) reported the rarer *P. nanum* from Sandall Beat, but the extant material is *P. aloides*.

Distichium capillaceum: (63) 43/58 Anston Quarry, Nov 1979.

Fissidens viridulus var *tenuifolius*: (63*) 43/59 Edlington Wood, M. Dalby *et al*, 22.8.71 (Doncaster Museum).

Octodiceras fontanum: (63* and 64*) 44/23 Leeds and Liverpool Canal, Leeds, Apr and May 1980. New to Yorkshire and most northerly British locality.

Encalypta vulgaris: (63) 43/58 Roche Abbey, J. H. Payne, 25.2.18 (Doncaster Museum).

Tortula laevipila: (64) Abbey Road, Knaresborough, F. E. Branson, Nov 1979.

Desmatodon cernuus: (63) 43/58 Anston Quarry, Nov 1979.

Pottia starkeana ssp *conica* (= *P. davalliana*): Roadside at Skellow, J. H. Payne, 13.3.22 (Doncaster Museum) — this is the only material labelled *P. starkeana* in Payne's herbarium, but it is not the rarer *P. starkeana* ssp. *starkeana*, for which Payne's is the only VC record.

Phascum curvicolle: (63) 43/58 Anston Quarry, Nov 1979.

Oxystegus tenuirostris: (63) 43/39 Wharnecliffe Woods, Dec 1979.

Leptodontium flexifolium: (63) 34/94 Rough pasture near Carleton, Feb 1980.

Tetraplodon mnioides: (63) 44/00 Sheep carcass, Wessenden Moor, July 1980.
Pohlia lutescens: (64*) 44/14 Laneside bank, Guiseley, Oct 1980.
Pohlia lescuriana: (63) 43/39 Bank in pasture, Wharnecliffe, Dec 1979.
Bryum alpinum: (63) 44/00 Marsden Clough, Mar 1980.
Bryum pallescens: (63*) 44/01 Concrete wall, Ryburn Reservoir, Mar 1980.
Zygodon viridissimus var *stirtonii*: (62*) Limestone, Wass Bank, YNU Exc, Sept 1980.
Thuidium philibertii: (63) 34/95 Damp limestone grassland between Gargrave and Skipton, Aug 1980.
Amblystegium humile: (63) 44/71 Soil at edge of shallow dyke, Will Pits, Thorne Waste, J. Verhees, 2.6.71 (Doncaster Museum); 44/30 Carlton Marsh, Barnsley, May 1980.
Drepanocladus uncinatus: (63) 34/94 Old quarry near Lothersdale, Feb 1980.
Rhynchostegiella teesdalei: (63*) 34/94 Park Gill Woods, Carleton, Feb 1980.
Eurhynchium praelongum var *stokesii*: (63*) 44/04 Sutton Clough, Glusburn, Aug 1980.
Brachythecium salebrosum: (63) The Hebden Bridge records are errors. M. O. Hill has confirmed the following record: wall by Thwaite Wood above Thwaite Hall near Firbeck, J. Brown, 1952 (BBSUK).
Brachythecium glareosum: (63) 34/94 Old quarry near Lothersdale, Feb 1980.
Isopterygium pulchellum: (63) 44/10 Harden Clough, Meltham, Jan 1980; 34/93 Near Ponden Reservoir, May 1980; 44/04 Sutton Clough, Glusburn, Aug 1980. Evidently an under-recorded species.
Orthothecium intricatum: (63) 44/04 Sutton Clough, Glusburn, Oct 1979.

An asterisk indicates a new vice-county record or an amendment to the Census Catalogue.

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FIELD NOTE

Artemesia annua L., an alien plant new to Yorkshire

In early September 1979 whilst working on arable land at Newton Hill, Wakefield (V.C 63; grid. ref. SE 325224), I came across an unfamiliar plant which I was unable to identify from the literature available to me . Consequently I consulted S. C. Madge, D. Grant and Mrs F. Houseman, none of whom were able to identify it other than as a member of the genus *Artemesia.*

I therefore sent the specimen to the Royal Botanic Gardens at Kew, where it was identified as *Artemesia annua* L. I also contacted the British Museum who put me in touch with Mr Eric J. Clement of the Botanical Society of the British Isles, to whom I am grateful for more detailed information on this species.

A. annua is native to south-east Europe and Turkey east through southern-central Asia to Japan and has been introduced into North America and probably elsewhere.

It has been reported as a very rare weed in Californian carrot seed (e.g. S. London, 1966). 'In wool shoddy there is only one record (from south Lancashire)' states Mr Clement who continues 'it is *certainly* a rare casual in Britain'.

A. annua is an annual growing to a height of some 50 cm., differing from the similar *A. vulgaris* in being brighter green, lacking silvery undersides to leaves and in having a more pleasant, sweeter aroma. The Newton Hill plant was in full flower, these being small and yellow but similar in outward appearance to those of *A. vulgaris.*

A. annua appears not to have been recorded before in Yorkshire and there is little doubt that the seeds of this plant came with wool shoddy which had been applied to the fields during the previous spring. It failed to reappear in 1980 but could easily be more frequent as a wool alien than present records suggest.

John Martin

SHORT-EARED OWLS *(ASIO FLAMMEUS)* AT CARLTON MARSH NATURE RESERVE DURING THE WINTER OF 1978–79

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During the period 7 October 1978 to 15 May 1979 a series of records of Short-eared Owls *Asio flammeus* occurring at the Carlton Marsh Nature Reserve, near Barnsley, South Yorkshire was collected. This paper examines the incidence of these occurrences and provides information on prey items based on an analysis of pellets collected at the reserve.

Introduction

The reserve is situated between the villages of Carlton and Shafton to the north-east of Barnsley (Map reference SE/379103) and comprises a subsidence flash bordered by agricultural land on its north, east and south aspects and by a series of operational railway lines on a wide elevated embankment to the west. The area is designated as a Local Nature Reserve and is owned by the Barnsley Metropolitan District Council.

Around the water area, the vegetation is predominantly *Juncus effusus*, *Typha latifolia* and *Glyceria maxima*, which grade on the western and southern margins into damp grassland containing a variety of typical species. Beyond this to the south is an area of dry grassland dominated by *Deschampsia flexuosa*, but also including *Festuca ovina*, *Brizia media*, *Cynosurus cristatus*, *Anthoxanthum odoratum*, and *Agrostis tenuis*. This, and the slope of the railway embankment, which is dominated by hawthorn *(Crataegus monogyna)*, hazel *(Coryllus avellana)* and crab apple *(Malus sylvestris)* scrub, were those areas over which the reserve owls most frequently hunted. Another area was regularly frequented by the birds during early November 1978. This was located approximately one mile west of the reserve and comprised an area of rough grassland on an undeveloped part of the Carlton Industrial Estate. This roosting area was quite remarkable in that it was surrounded on all sides by urban or industrial development. Access to the reserve area by the birds could, however, be gained along a corridor of land associated with a reclaimed colliery spoil heap.

An indication of both use of, and affiliation to, this site is provided by the records of five birds roosting there on the 1 November 1978 and eight being present by the middle of that month. At that point the birds appeared to disperse to a number of locations, one of which was the nature reserve.

The roost used at the reserve was rough grassland in a triangular-shaped area set amidst a series of railway lines. This was used until late February 1979 when a nearby, narrow gully 30 metres long and 4 metres deep adjacent to an operational line was adopted. This was somewhat devoid of vegetation and had rubble and miscellaneous debris along its base. From then until mid-April this site was used regularly.

Incidence of Records

The first birds of the autumn occurred on 7 October at the reserve and 31 October 1978 at the Industrial Estate roost.

From 1 November 1978 to the middle of November no records were obtained at the reserve but between five and eight birds occurred at the Industrial Estate roost. From 15 November to the end of December 1978 birds were regularly recorded at the reserve with a maximum of three on 19 November 1978. The initial roost had disbanded and the birds appeared to have dispersed more widely or moved completely out of the area. From the beginning of January 1979 more birds were recorded at the reserve and it appeared that hunting activities and roosting were centred on the area. During that month four on 7th, five six on 24th, and four on 28th were the maxima but singles or pairs were recorded on most other dates. This pattern was repeated during February 1979 with a maximum of seven birds being recorded on 24th with five of these being present in the gully adopted as a roost site.

During March 1979 the number of birds recorded until 29th was quite low (maximum three) but then six were present in the roost on 30th. After four and three being recorded on 1 and 4 April respectively it appeared that two birds only were in the area. These remained until 15 May when no further evidence of their presence was available.

Throughout the last week of March at least one bird was heard to call on several occasions whilst in flight during the daytime. In the late afternoon of 22 March 1979, E. M. Bennett and the writer watched a pair in full display over rough grassland to the north of the marsh, and display was similarly observed on several other occasions during April and May.

During 1976 birds were occasionally seen at the reserve but none was recorded there in 1977. It is known that larger numbers than normal of these birds were present in Britain during the winter of 1978/79 and it is against this fact that this unprecedented series of records must be viewed. Additionally, during the same period the weather was quite severe with prolonged priods of snow and this, plus an ample availability of food, may also have led to the concentration of birds.

Results of Pellet Analysis

At intervals throughout the winter pellets were collected from the roost site or from below posts that were obviously used as vantage points or resting stations during hunting. During the adverse weather many pellets were obviously lost but fifty-eight were collected and analysed. The average size of these was 42.37 mm × 21.15 mm with a range in length of 28–71 mm.

Prey species	No. of items	% of total prey
Short-tailed Vole, *Microtus agrestis*	76	81.72
Bank Vole, *Clethrionomys glareolus*	13	13.98
Harvest Mouse, *Micromys minutus*	3	3.23
Common Shrew, *Sorex araneus*	1	1.07

The distribution of the prey items within the fifty-eight pellets was as follows:

pellets with three prey items	17.24%
pellets with two prey items	25.86%
pellets with only one pre item	56.90%

Glue (*Bird Study* **17**: 39–42, 1970) in his summary of British data on the prey of the Short-eared Owl showed that whilst the Short-tailed Vole in particular, but also other rodents, form the main part of the bird's diet, birds can become the predominant prey especially during severe weather.

Additionally Vernon (*Bird Study* **19**: 114–15, 1972) showed that the Brown Rat *(Rattus norvegicus)* formed the main part of the bird's diet (63.5%) in autumn but that from about December birds (15.5% of prey) and the Wood Mouse *(Apodemus sylvaticus)* (13.5% of prey) predominated, with Short-tailed Voles being taken in much smaller numbers (6.5% of prey) throughout the whole period.

A comparison of the bird prey species quoted in the two papers with those known to be present/roosting at the reserve during the period shows a number of striking similarities. However this appears to indicate the owls were selectively taking Short-tailed Voles as their main prey presumably because of their abundance, and not exploiting some of the other available prey, such as birds, within the same area. Similarly, the Brown Rat is recorded quite frequently around the reserve although, by contrast, no records exist for the Wood Mouse.

Evidently it would seem that the Short-tailed Vole can be an important prey species even in severe weather, if it is sufficiently abundant and that bird prey species are not always exploited as an alternative. It is also interesting to note that the Brown Rat was not apparently taken as prey during the period despite its obvious availability.

Glue also cites two instances, one at a north Kent marshland breeding site, and the other at a wintering site at Nursling, Hampshire, where Short-tailed Vole comprised a similar predominant proportion of the diet as in the birds present at Carlton Marsh Nature Reserve. Due to such variations between analysed results there is obviously a need to examine pellets collected during a series of different winters where the population levels of the different prey species are known and the effects of weather conditions can be investigated.

SUMMARY

1. During the 1978/79 winter Short-eared Owls were recorded at unprecedented levels at the Carlton Marsh Nature Reserve, near Barnsley, South Yorkshire. Birds occurred between 7th October 1978 and 15th May 1979 with a maximum of eight being recorded.

2. The roost sites adopted are described and the incidence of records throughout the period examined.

3. Pellets were collected and analysed. This showed that the predominant prey species was Short-tailed Vole, and that no birds or Brown Rats were taken in contrast to other analyses.

ACKNOWLEDGEMENT

I would like to thank E. M. Bennett, G. Blunt and C. Gorman for their kind assistance in providing information and collecting pellets, J. R. Mather for his comments on the draft of this paper, and Mrs S. Middleton for typing and checking the manuscript.

DR E. WILFRED TAYLOR

Dr E. Wilfred Taylor, CBE, FRS died on 1 November 1980 at the age of eighty-nine. He was rightly proud of the fact that he was the longest serving Member of the Yorkshire Naturalists' Union, having joined as a young man in 1911. During almost seventy years' membership he served on many Union Committees, becoming President in 1955.

He went to Oundle School, which provided a more liberal education than many public schools at that time, and where he came to know the Northamptonshire countryside by day and night, winter and summer, sometimes breaking school rules to do so! School workshops enabled him to become skilled with his hands, and it was inevitable that he should go straight into the firm of T. Cooke & Sons of York, of which his father was then optical manager. Later in life Wilfred Taylor frequently regretted that he never had a university training, but this did not preclude his election to a Fellowship of the Royal Society (1952) in recognition of his contributions to the development of optical instruments. Nearer home, the University of Leeds honoured him with the award of an honorary DSc in 1957, and somewhat later the newly-established University of York conferred on him a university doctorate. He was created CBE in 1946 in recognition of his contribution to the war effort.

In November 1911, soon after joining the Union, Wilfred Taylor was elected member of the Wild Birds & Egg Protection (Act) Committee. He continued to serve the Union in this capacity for a remarkable unbroken period of sixty-one years, the last twenty-four of which he was Chairman. It was particularly in collaboration with Ralph Chislett and later with Charles Wilson that his dedicated leadership was most apparent. While it is difficult to point to any specifically dramatic piece of work or achievement with which Wilfred Taylor was associated, it was certainly a period of hard work with great attention to detail. It is ironic that so much time was unsuccessfully devoted to the protection of Peregrine breeding sites (including that at Bempton), the breeding of Montagu's Harriers, and the nesting of Stone Curlews and Little Terns.

While still a schoolboy, Wilfred Taylor came under the influence of Oxley Grabham, curator at The Yorkshire Museum, who encouraged and fostered his interest in natural history. The foundations of his enthusiasm for bats were laid at this time, and it is significant that most of the Yorkshire bat records in the national data bank at Monks Wood (apart from very recent additions) are in Wilfred Taylor's name. His interest in the vertebrates was

comprehensive, including fish, amphibia, reptiles, birds, and mammals, and he took over as General Secretary of the Vertebrates Section in 1920. From then until 1938 his reports on Vertebrate Zoology in Yorkshire, published in the *Naturalist*, contain a wealth of observation and comment that in themselves provide a fitting tribute to the naturalist he was. He was Chairman of the Vertebrate Section during the war years, and with its re-organization he became the first Chairman of the newly-formed Mammals, Reptiles, Amphibians and Fish Committee (1950–1952). His friendship with Adam Gordon, gamekeeper and taxidermist from Duncombe Park, Helmsley, was a constant delight to him, particularly during his later years when his physical powers and eyesight were beginning to fail and it became necessary to enjoy his field work less energetically.

During his early field work he developed considerable skill in the use of a camera, and much of his work with birds of prey at that time was illustrated with remarkable photographs he had taken. An article in *The Naturalist* in 1914 on the habits of the Merlin included four photographs of chicks and adults at the nest, providing a clear indication of the quality of his work. During the 1950s he was Chairman of the Ornithological Committee (1953–1956), Ornithological Recorder for the York District (1943–1957), and joint editor with Ralph Chislett of the YNU Ornithological Report (1957–1959).

In many ways, Wilfred Taylor's term of office as President of the Union served as a turning point in his interests. His Presidential Address in 1956 was a masterly summary of the status of mammals in Yorkshire and has served as a standard reference for many years; but from that time onwards it seems as if he wanted to devote his time and energy to nature conservation. In the mid-1950s he retired from full-time business commitments with the Vickers organization, and the Presidency of the Yorkshire Naturalists' Trust suddenly became more demanding with the negotiations for the acquisition of Spurn.

From 1956 until the time of his death Wilfred Taylor limited his official connection with the Union to his role as Vice-President and as Chairman of the Wild Birds & Egg Protection Committee, while devoting most of his energies to the work of the Trust. However, like so many present-day naturalists, he felt that the work of the two organizations was complementary: the Trust would be less well informed without access to the body of factual information provided by field naturalists all over the county, while the Union would be relatively powerless to prevent or meet threats to the Yorkshire countryside without the increasing power of the Trust. Wilfred Taylor saw it as a duty to draw the two organizations ever more closely together, but he realized that a complete amalgamation might do much to weaken the strengths that are associated with independence.

In the latter part of his life, Wilfred Taylor found increasing pleasure in the study of plant life. This may have arisen out of his desire to understand more clearly the basis of ecological principles. Like all good naturalists, he never stopped learning, and he realized that a sound judgement on matters of nature conservation must be based on a knowledge of all the organisms involved together with their environment.

CJS

BOOK REVIEW

Intertidal Invertebrates of California by **Robert H. Morris, Donald P. Abbott** and **Eugene C. Haderlie**. Pp. xii + 690, plus 200 pages of full colour plates. Stanford University Press, California. 1980. $30.

This work provides a detailed systematic treatment by numerous text contributors of the major orders, with exhaustive references (more than 5500 sources) to the literature. Each species description contains information on distinctive characters, range and habitat, life history where known, interactions with other species, economic importance, and current research. Descriptions are supported by lavish colour photography.

Although designed as a manual to the Californian coastline, much of the content is relevant to America as a whole, and will also prove useful over a wider area.

This work maintains the very high standards of scholarship and production we have come to expect from this publishing house (see also *Naturalist* **104**: 129; **105**: 132).

SOME NEW VICE-COUNTY RECORDS FOR WOODLICE IN YORKSHIRE

G. D. FUSSEY and D. T. RICHARDSON

Two recent field collections made in Yorkshire have yielded a number of new vice-county records for isopods.

The first collection, taken at Saltwick Nab, near Whitby (VC 62; 45(NZ)/914113; alt. 10 m) on 3.6.1980, consisted of two specimens of *Cylisticus convexus* and one each of *Armadillidium pulchellum* and *Trichoniscoides albidus*. The animals were taken from amongst chips of alum shale a few metres from where the Nab drops down to the beach. These are new vice-county records for *C. convexus*, a species considered to favour synanthropic habitats but often native in coastal areas, and *A. pulchellum*. The only record of *T. albidus* for Yorkshire was given in Rhodes (1916). Since this record cannot be substantiated, and is, on this basis left out of the British Isopoda Study Group *Atlas* (Harding, 1976), it seems appropriate to consider this present record to be the first for this vice-county and the second for Yorkshire. It was recently found in East Yorkshire (Fussey, 1980).

The second collection from underneath a stone on the banks of the Leeds-Liverpool canal at Bank Newton, 34(SD)/910520; alt. 125 m on 22.6.1980 consisted of a single specimen of *A. pulchellum* which is the first record for VC 63.

All three species exhibit similar distribution patterns, in that though they are considered uncommon, they are nevertheless widespread in their range. It seems likely that these species might prove much more common if specifically searched for.

We would like to thank Paul Harding for confirming the identification of *A. pulchellum* from Saltwick Nab, and Ian Varndell for his assistance with the field work.

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THE DISCOVERY OF MICROLEPIDOPTERA FROM THE H. H. CORBETT COLLECTION

HARRY E. BEAUMONT

Dr H. H. Corbett (1856–1921) of 9 Priory Place, Doncaster was one of a small number of active and competent microlepidopterists resident in Yorkshire in the early years of the present century. The majority of his collecting appears to have taken place in the immediate vicinity of Doncaster, favourite localities, judging from his published records, being Wheatley Wood. Hatfield Moors and the Askern area. Unfortunately little of his, presumably extensive, lepidoptera collection has survived and until recently the only known extant specimens were about fifty of his larger moths and two or three micros in Doncaster Museum, none of them being of particular significance (P. Skidmore, *pers comm*).

While on a brief visit to Weston Park Museum, Sheffield on 10 November 1980 I was shown a store box containing microlepidoptera which had formed part of the collecton of William Buckley of Skelmanthorpe whose collection was purchased at auction by Sheffield Museum in 1972.

The majority of specimens in the store box were either unlabelled or were from localities in the south of England but my attenton was attracted to a number which carried labels

indicating that they had been taken in the Doncaster area in 1920. As with many collections of that era the data labels on the specimens did not include the name of the collector but the familiar locality names of Wheatley Wood and Hatfield made me strongly suspect that they were some of Corbett's specimens.

They had evidently been exhibited at some time for below each species was a handwritten label giving, in addition to the name of the species, brief explanatory comments.

On returning home my suspicions were confirmed when it was found that the specimens in question coincided exactly with a list of species exhibited by Dr Corbett at the YNU entomological section meeting at Leeds on 30 October 1920 (*Naturalist* 1921:31).

This material consists of twenty-eight moths of eight species, the most interesting being two species which Corbett added to the Yorkshire list in 1920. These are:

Cydia splendana (Hubn.) One specimen, the data label reads 'Doncaster 10.8.20' and the explanatory label below reads '*Carpocapsa splendana* New to Yorkshire. Taken at rest on stone wall below a tree of *Quercus cerris* 10.8.20'.

Capperia britanniodactyla (Gregs.) Six specimens bearing data labels inscribed 'Hatfield' and dated 12.7.20 (2), 15.7.20 (3) and 18.7.20 (1). The explanatory label reads '*Oxyptilus teucrii* New to Yorkshire. Taken at Hatfield on *Teucrium scorodonia*'.

The remaining six species do not call for special comment and are listed below with the names used on the labels given in parentheses where these differ from current nomenclature.

Adela reamurella (L.) *(A. viridella)* Wheatley Wood, 13.5.20 (5 specimens).

Adela rufimitrella (Scop.) Askern, 26.6.20 (1 specimen).

Clepsis consimilana (Hubn.) *(Tortrix unifasciana)* Locality unrecorded, 5.10.20 (1 specimen).

Philedonides lunana (Thumb.) *(amphisa walkerana)* Wheatley Wood, 3.20 (4 specimens plus one unlabelled). This species is listed as *Amphisa prodromana* in the list of exhibits in the *Naturalist* (1921: 31).

Eudonia angustea (Curt.) *(Scoparia angustea)* Doncaster, 8.20 (6 specimens).

Pyrausta cespitalis (D. & S.) *(Herbula cespitalis)* Hatfield, 13.7.20 (1), 15.7.20 (1), 1.9.20 (1 specimen).

How the specimens comprising this exhibit were acquired by Buckley is a matter of conjecture; however the fact that Corbett died the following year (obituary in the *Naturalist* 1921: 145–9) makes it likely that this was the last exhibit that he assembled and probably accounts for it remaining together and not being broken up and the component species being returned to their respective places in his collection.

It was thought advisable to place this discovery on record in view of the historic interest of the two species which were new to Yorkshire and the fact that there can be few entomological exhibits that have survived intact for sixty years.

My thanks are due to Mr S. P. Garland for showing me the microlepidoptera housed at Sheffield Museum and to Mr P. Skidmore for his helpful comments regarding Corbett's specimens at Doncaster Museum.

FIELD NOTE

A new Leisler's Bat *Nyctalus leisleri* record from Yorkshire

On 17.9.80 Stephen Turner of Fulford, York, found a *N. leisleri* and passed it to me to confirm its identity. The bat was found dead near one of the permanent exhibits of the open-air sculpture exhibition at Bretton Park, near Wakefield — (grid ref. 44/2812). It is now in the Sheffield Museum (Museum No. SHEFM. 1980.617).

Dr Robert Stebbings at Monks Wood, suggests it was 'a young adult female, possibly two years old, and which did not breed in 1980'. It has very dark pelage often indicative of young bats. Derek Whiteley of the Sheffield Museum gives the following measurements for the bat: weight 10.00 g, forearm 44.0 mm, hind foot 9.2 mm, head and body, *c*. 63.0 mm, tail *c*. 38.0 mm, wing-span *c*. 280.0 mm, ear 13.0 mm long, 10 mm wide.

Yorkshire is at the northern range of *N. leisleri* in Britain, and this is now the most northerly record. Cannock Chase in the West Midlands is the nearest known breeding site

(Stebbings 1980, pers. comm.), but undoubtedly there will be others, some probably in Yorkshire. Yorkshire records of *N. leisleri* are detailed in the following table.

Locality	*Altitude*	*Date*	*No.*	*Remarks*	*Author*	*Grid Ref.*
Leeds	—	1840	3	Old chimney shaft site	F. Bond	44/33
Mexborough	—	1890	7	Shot, one in B.M.	W. D. Roebuck	43/49
Barnsley	—	1905	1	Confirmed by B.M.	J. Armitage	44/30
Stainborough	—	1907	4	—	A. Whitaker	44/20
Monk Fryston	—	1907	6	—	A. Whitaker	44/52
Worsborough	—	1907	1	—	A. Whitaker	44/40
Oulton	—	1909	—	—	A. Whitaker	44/32
Rockley*	300	1909	1	Killed 7.8.09	No author	44/3202
Rockley†	300	1909	1	Killed 9.8.09	No author	44/3202
Barnsley	—	1910	—	—	A. Whitaker	44/30
Worsborough	—	1911	—	—	A. Whitaker	44/40
Stainborough	—	1913	1	—	A. Whitaker	44/20
Halifax	—	1957	1	—	E. Hazelwood	44/02
Bretton Park	—	1980	1	—	M. J. A. Thompson	44/2812

*Sheffield City Museum — specimen no. 1964–1369
†Sheffield City Museum — specimen no. A1909 — 2

I should like to thank Henry R. Arnold of the Biological Records Centre, Monks Wood for supplying me with the record data, and Dr R. E. Stebbings for critically examining the specimen.

Michael J. A. Thompson

BOOK REVIEWS

The West Highland Way by **Robert Aitken**. Pp. 175, plus folding map. HMSO. 1980. £4.75. The West Highland Way and this booklet about it have been a long time in preparation, as they were initiated by the Countryside (Scotland) Act 1967 and a Countryside Commission Report 1972. The booklet bears indelible marks of its period. We read that the authors of the Way had a 'remit' and that some of the subject matter was 'outwith' it. The design is very early 70s. It is printed in a purply-brown ink on cream coloured paper; the line drawings, probably quite good if they could be seen properly, are printed in yellow! For some reason most of the photographs are also printed in purply-sepia, show the mountains in mid Winter. It is to be hoped that in the '80s such publications will move away from jargon and silly tricks of design. The Way is the first official long distance footpath to have been established in Scotland and runs for 152 km (95 miles) from the outskirts of Glasgow to Fort William. In the booklet it is described in fourteen sections varying in length from 4 to 15 km. The information given about each section is interesting and accompanying map makes them quite easy to follow. The latter is based on the Ordnance Survey 1:50,000 map and is in four sections. These are skewed to give as symmetrical coverage of the surrounding country as possible, which takes a little getting used to at first. By applying Naismith's rule for timing fell walking, that is allowing an hour for each 5 km on the flat plus half an hour for each 300 m of ascent, it is obvious that an average walker could complete more than one section in a day. The booklet suggests that the whole route could be covered in a week. Many people will react to a fully signposted 'way' through the mountains with mixed feelings, but no doubt many others will welcome it, and they will need, and make good use of, this guide.

FHB

The Natural History of Shetland by **R. J. Berry** and **J. L. Johnston**. Pp. 380 (including numerous diagrams, maps and tables), plus 16 pages of b/w and 8 pages of colour photographs. Collins. 1980. £8.50.

This latest 'New Naturalist' title maintains the very high standard we have come to expect from this series. It differs from previous titles in that the photographic plates are grouped together (for economic reasons) rather than spread throughout the text. The book contains a wealth of information on most aspects of the natural history in relation to their physical and biological setting. Interesting general accounts of Shetland naturalists, the impact of oil development, and conservation are also included, as well as authoritative lists (as appendices) of fungi, marine algae, bryophytes, lichens, flowering-plants, and ferns, Siphonaptera, Lepidoptera, Coleoptera, spiders, land and freshwater molluscs, and birds; a comprehensive list of places to visit; and a detailed bibliography.

Portrait of a Country Artist by **Ian Niall**. Pp. 160, including many b/w, tinted and full colour plates. Victor Gollancz. 1980. £10.

A delightful tribute to Charles Tunnicliffe, RA (1901–1979), which shows not only his talent as a bird artist but also his expertise in the portrayal of other natural history subjects and the landscape. The book is copiously illustrated with his wood-engravings, etchings, water-colours, and pen and ink sketches, together with photographs of the artist and examples from his sketchbooks; the whole is held together by a sympathetic text.

Sir Joseph Banks. 18th Century Explorer, Botanist and Entrepreneur by **Charles Lyte**. Pp. 248, including monochrome and full colour plates. David & Charles, Newton Abbot. 1980. £10.50.

Joseph Banks (1743–1820), son of a wealthy Lincolnshire landowner with estates at Revesby, was one of the most significant figures of the late eighteenth century. He became a skilled botanist and devoted his life and fortune to pursuing and promoting plant sciences, and was a generous patron to the sciences in general. Following botanical and zoological surveys of Newfoundland and Labrador, he accompanied Captain Cook on his first voyage around the world as one of the party of naturalists. Amongst Banks' many achievements can be numbered his presidency of The Royal Society for forty-two years, his promotion of many scientific enterprises, his role in the colonization of Australia, and his unofficial directorship of Kew Gardens. His memory is perpetuated through the many plant epithets which bear his name.

Although numerous scholarly works, such as those devoted to critical analyses of his correspondence and journals, have been published, surprisingly few general biographical accounts are available; the most recent of these was H. C. Cameron's *Sir Joseph Banks* published in 1952. The latter is sadly out of print, but from personal experience may still be encountered fairly frequently in second-hand bookshops. Charles Lyte, although covering essentially the same ground as Cameron, provides a welcome new account of this fascinating man and the times in which he lived; however, this new biography does not supersede the earlier work as it lacks comparable supporting reference and bibliographical material. Nevertheless, this new account will provide an introduction to eighteenth-century exploration and the origin of learned societies which undoubtedly paved the way for Darwin, Wallace, etc.

MRDS

Love among the Butterflies: The Travels and Adventures of a Victorian Lady by **Margaret Fountaine**, and edited by **W. F. Cater**. Pp. 224, illustrated in colour and sepia half-tones. Collins. 1980. £8.50.

The Fountaine-Neimy collection of diurnal lepidoptera consisting of 20,000 specimens from all over the world was bequeathed to the Castle Museum in Norwich by Margaret Elizabeth Fountaine in 1940. She also bequeathed a diary which she had kept from 1878 to 1939 with the stipulation that the twelve volumes in which it was written should remain in a sealed box until 1978. Now an edited version of less than a quarter of the diary has been published, embellished with period illustrations. It is perhaps a pity that the editing has been done by a

newspaper man who has concentrated on so-called human interest, and we read less than we would have liked about the insects she collected, and the eminent lepidopterists she knew, and nothing of her travels after 1914, although she still had more than two decades of collecting before her in Australia and America.

FHB

Why Big Fierce Animals are Rare by **Paul Colinvaux**, with illustrations by **Varna Haggerty**. Pp. ix + 224. Allen & Unwin. 1980. £7.95.

The scope and depth of this book are perhaps not fully revealed by the title. Paul Colinvaux expertly guides the reader, whether student or layman, through many of the major ecological concepts. He draws his material from the works of such pioneers as Elton, Gause and Clements right through to areas of ecological thought currently receiving much attention. It is most encouraging to find that he can cover such topics as the niche, ecological pyramids, energy and nutrient cycling, vegetation classification, homeostasis of the physical environment, succession, co-existence, predation, territory, speciation, stability and diversity, without becoming either too technical or disjointed.

Colinvaux rounds off his lucid account with a presentation of his ideas as to how man fits into the scheme of nature. Having whetted the reader's appetite, a guide to further reading is provided which includes a short but inspiring bibliography.

This book, which is also available in paperback (Pelican, £1.95), is to be thoroughly recommended to all with an interest in the workings of the natural world around them.

JEPC

Wild Horizons by **Dieter Plage**. Pp. 216, with 31 colour and 43 monochrome photographs, and 5 maps. Collins. 1980. £8.95.

Dieter Plage is a professional wildlife photographer of considerable standing. During the 1960s and early 1970s Plage spent considerable time working on assignments in Africa. These ranged from the wildlife reserves and deserts of Namibia in the south, through central and east Africa to the uplands of Ethiopia.

The book is a collection of the author's reminiscences. These include the exciting and the dangerous, the humorous and the sad but always written in an easily readable style. The account is illustrated with many superb colour and monochrome photographs which reflect not only the author's photographic skills but also considerable artistic appreciation. This is an attractively produced volume.

MJD

Survival in the Wild by **Cindy Buxton**. Pp. 102, with 18 colour plates. Collins. 1980. £5.95.

A young woman's experiences filming wildlife in Africa. An attractive light-hearted account, richly illustrated with first-class photographs.

AVD

Sexual Strategy by **Tim Halliday**. Pp. 158, plus 60 b/w plates and 32 pages of colour photographs. Oxford University Press. 1980. £6.95.

This book deals with the behaviour that precedes, accompanies and follows the act of mating in a wide variety of animals. Special emphasis is given to the amphibians, reflecting the author's interest in this group. The topic is presented from the point of view of the new sicence of sociobilogy. Tim Halliday shows how the behaviour of an individual will increase the survival of the maximum number of his or her offspring or the offspring of near relatives to reproductive age. The text is interesting to read, reporting on very recent research and the many photographs are usually of very high quality. A brief final chapter discussing human sexual strategy suggests that both biological and cultural factors are important in explaining the wide diversity of human sexual practices. A thoroughly fascinating book.

MEA

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Edited by M. R. D. SEAWARD, MSc, PhD, FLS, The University, Bradford

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 15p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

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Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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LICHEN FLORA OF THE WEST YORKSHIRE CONURBATION — SUPPLEMENT II (1978–1980)

M. R. D. SEAWARD
School of Environmental Science, University of Bradford

Numerous additions to the lichen flora of the West Yorkshire conurbation (Seaward, 1975, 1978) have been made during the past three years as a result of a continuing programme of fieldwork by Mr P. M. Earland-Bennett, Mr A. Henderson and myself; several records relating to this work have been published elsewhere (Earland-Bennett, 1979, 1979a; Henderson, 1980). Numerous corrections to the lichen flora are also necessary in the light of taxonomic revisions, complied by Hawksworth *et al.* (1980).

Since the implementaion of the Clean Air Acts (1956 and 1968) the range of sulphur dioxide concentrations in the West Yorkshire conurbation has declined considerably, resulting in a more homogeneous distribution of this pollutant. This means that recently collected data do not provide a convincing demonstration of any relationship between species diversity of lichens and air pollution level (Seaward, 1976). Furthermore, an intensive search of a wide range of substrates (including microhabitats) within a 1 km × 1 km grid square recording unit, even near to the centre of Leeds, can result in a significant increase in the species tally. Nevertheless, a species diversity count, based on field records of reasonably identifiable lichens which occur frequently within a defined area and are not restricted to a microhabitat. can be useful for

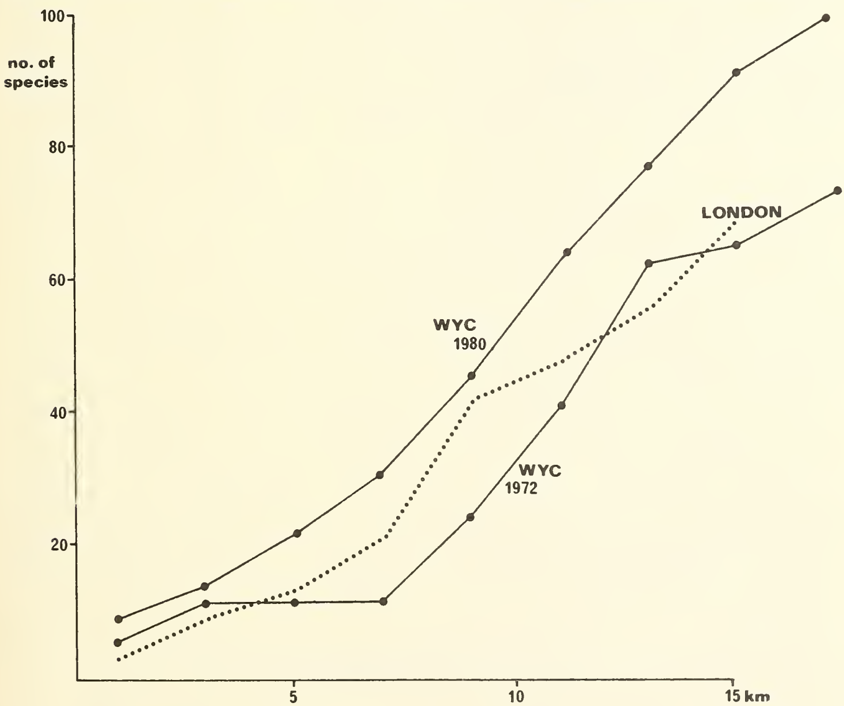

FIGURE 1
Graph to illustrate the increase in lichen diversity with increasing distance from the centre of West Yorkshire conurbation (WYC) in 1972 and 1980; source of comparative London data: Laundon (1970).

evaluating the general level of air pollution, particularly in respect of transects radiating from urban and/or industrial complexes. The amelioration of the atmosphere of the West Yorkshire conurbation can be effectively demonstrated by a comparison of transect data for 1972 and 1980 (Fig 1).

Acarospora fuscata (Nyl.) Arnold
Add B.

Anisomeridium juistense (Erichsen) R. C. Harris
Coppins and Seaward, 1974 (in herb.E). U. On *Ulmus*. Rare.

Aspicilia calcarea (L.) Mudd
Add M. On calcareous gravestones and concrete pathway. Uncommon.

A. contorta (Hoffm.) Krempelh.
Add M, W. On concrete pathway and calcareous gravestone. Uncommon.

Bacidia chlorococca (Graewe ex Stenhammar) Lettau
See *Scoliciosporum chlorococcum* (Graewe ex Stenhammar) Vězda

B. chloroticula (Nyl.) A. L. Sm.
Henderson, 1980. M. On cement-aggregate. Rare.

B. sabuletorum (Schreber) Lettau
Add M.

B. umbrina (Ach.) Bausch
See *Scoliciosporum umbrinum* (Ach.) Arnold

Biatorella moriformis (Ach.) Th.Fr.
See *Strangospora moriformis* (Ach.) Stein

B. pinicola (Massal.) Anzi
See *Strangospora pinicola* (Massal.) Körber

Buellia punctata (Hoffm.) Massal.
Add G; on siltstone pebble — rare on this substrate.

Caloplaca citrina (Hoffm.) Th.Fr.
Add I, L.

C. heppiana (Müll.Arg.) Zahlbr.
Add M; on calcareous gravestones. Rare.

Candelariella heidelbergensis (Nyl.) Poelt
Henderson, 1974. W. On asbestos-cement. Rare. (See Earland-Bennett, 1979a.)

Catillaria chalybeia (Borrer) Massal.
Delete(T), add M, T.

Cladonia chlorophaea (Flörke ex Sommerf.) Sprengel
Add W.

C. coniocraea auct.
Add D.

C. conista auct. angl. non Robbins ex Allen
See *C. conoidea* Ahti

C. conistea (Delise) Asah.
Nom. illegit., transfer all records to *C. conoidea* Ahti.

C. conoidea Ahti
Revised distribution: A, C, G, H, M, O-Q, S, U, W. On neutral soils. of mainly spoil tips and disused railway cuttings. Locally frequent.

C. furcata (Huds.) Schrader
Add M.

C. glauca Flörke
Earland-Bennett, 1977. G. On soil over siltstone wall beside canal. Rare.

C. impexa Harm.
See *C. portentosa* (Dufour) Coem.

C. polydactyla (Flörke) Sprengel
Add M.

C. portentosa (Dufour) Coem.
Add W.

Collema crispum (Huds.) Wigg.
Add M; see Henderson (1980).

Fuscidea praeruptorum (Du Rietz and Magnusson) V. Wirth and Vezda
Earland-Bennett, 1979. V. Vertical surface of Millstone grit boulder in wall. Rare.

Huilia crustulata (Ach.) Hertel
Delete (T), add T; on siltstone boulder.

Hypogymnia physodes (L.) Nyl.
Delete (B), (W), add B, D, W. Occasionally reappearing in urban areas, following amelioration of atmosphere during the past ten years (see Fig 2). For example, several small (under 0.5 cm^2) thalli of this species, *Parmelia saxatilis* and *Physcia tenella* have recently colonized a young *Salix* near to the centre of Leeds (GR: 44/288359) — A. Henderson (pers. comm.)

Lecania erysibe (Ach.) Mudd
Add I, L.

Lecanora calcarea (L.) Sommerf.
See *Aspicilia calcarea* (L.) Mudd

L. conizaeoides Nyl. ex Crombie
The distribution map (Fig 3) is included as an indication of those areas critically surveyed to date (cf. Seaward, 1975, Fig 23 and 1978, Fig 3).

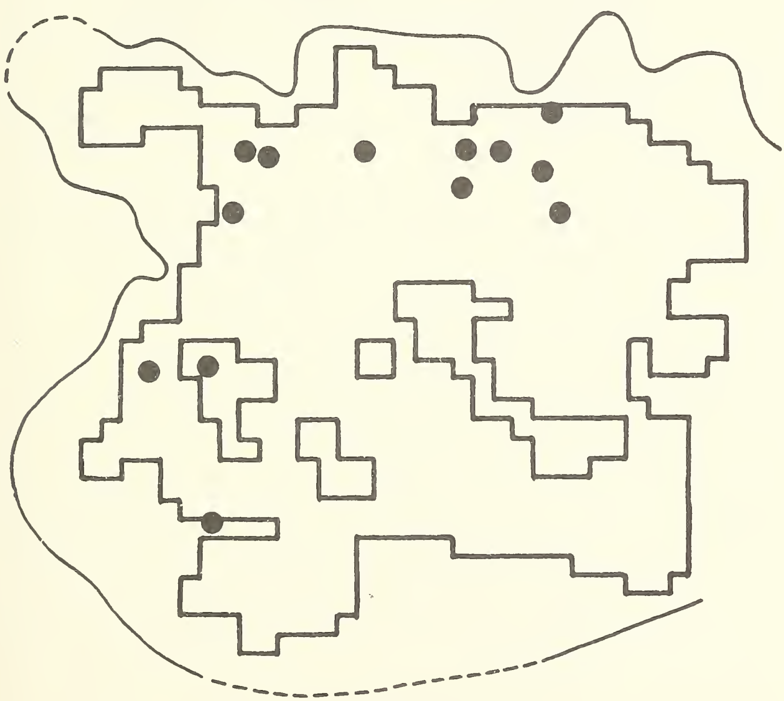

FIGURE 2

West Yorkshire conurbation: distribution of *Hypogymnia physodes*, showing (a) major inner limit equivalent to mean winter sulphur dioxide level of *c*. 70 ug/m^3 (see Hawksworth and Rose, 1976, Table 5), and (b) disjunct recent sightings (●) within the urbanized area (see Seaward, 1978, Fig 2) suggesting local atmospheric amelioration or influence of microclimatic conditions.

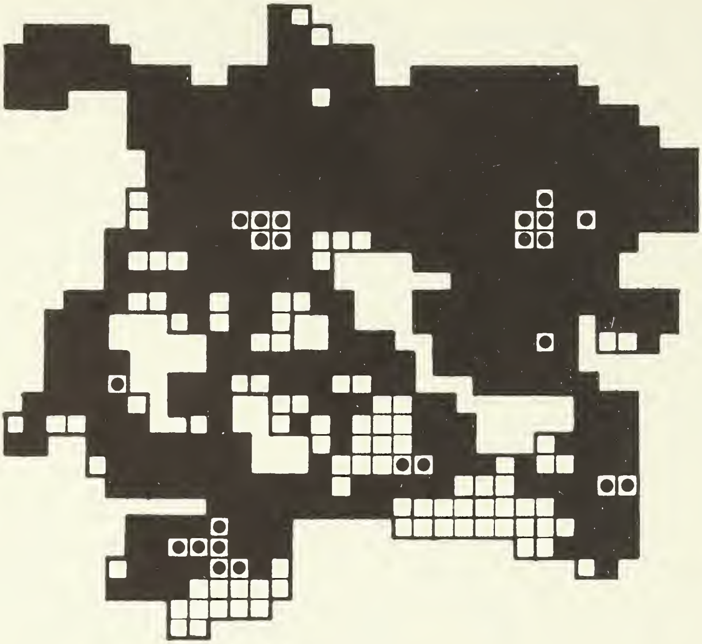

FIGURE 3
West Yorkshire conurbation: the distribution of *Lecanora conizaeoides* (rarity denoted by spots) reflects the 1 km^2 urban recording units so far investigated.

L. contorta (Hoffm.) Steiner
See *Aspicilia contorta* (Hoffm.) Krempelh.

L. epanora (Ach.) Ach.
A few earlier records (see Seaward, 1975, p.190) are referable to *L. subaurea* Zahlbr.

L. intricata var. *soralifera* Suza
See *L. soralifera* (Suza) Räsänen

L. muralis (Schreber) Rabenh.
First record = Smith, 1784 (in Galloway, 1979): 'I have seen this Lichen on large flat stones about Wakefield Yorkshire assume a centrifugal figure, forming a large circular band an inch broad and often 12–20 inches in circumference . . .'
Fig 4 shows its distribution within the conurbation in 1980 (cf. Seaward, 1975, Fig 27 and 1978, Fig 4); reinvasion into the conurbation continues at a rate of *c.* 9 km^2 per annum.

L. polytropa (Hoffm.) Rabenh.
Add B. Probably less frequent than indicated in Seaward (1975, p. 192); numerous records referable to *L. stenotropa* Nyl.

L. saligna (Schrader) Zahlbr.
Earland-Bennett, 1976. T. On decorticate bole of *Sambucus*. Rare.

L. soralifera (Suza) Räsänen
Add B.

L. stenotropa Nyl.
Seaward, 1968, D, E, G-I, L, M, Q, T-W. Frequent, on mortar, concrete, calcareous siltstone walls and asbestos-cement; less frequent on non-calcareous siltstone. (See Earland-Bennett, 1979a.)

L. subaurea Zahlbr.
Earland-Bennett, 1971. G, T, V. On siltstone walls, on more illuminated surfaces (e.g. coping stones) than *L. epanora* (Ach.) Ach. and rarer than that species. Uncommon. (See Earland-Bennett, 1975.)

Lecidea aeruginosa Borrer
Earland-Bennett and Henderson, 1980. V. On old tree stump. Rare.

L. crustulata (Ach.) Sprengel
See *Huilia crustulata* (Ach.) Hertel

L. fuscoatra (L.) Ach.
Add T; on coping of Millstone grit walls. Uncommon.

L. leucophaea (Flörke ex Rabenh.) Nyl.
Earland-Bennett, 1971. T, V. On siltstone walls. Rare.

L. scabra Taylor
See *Lecidella scabra* (Taylor) Hertel and Leuckert

L. stigmatea Ach.
See *Lecidella stigmatea* (Ach.) Hertel and Leuckert

Lecidella scabra (Taylor) Hertel and Leuckert
Add B.

L. stigmatea (Ach.) Hertel and Leuckert
Add I, L, R, S.

Lepraria zonata Brodo
Add G.

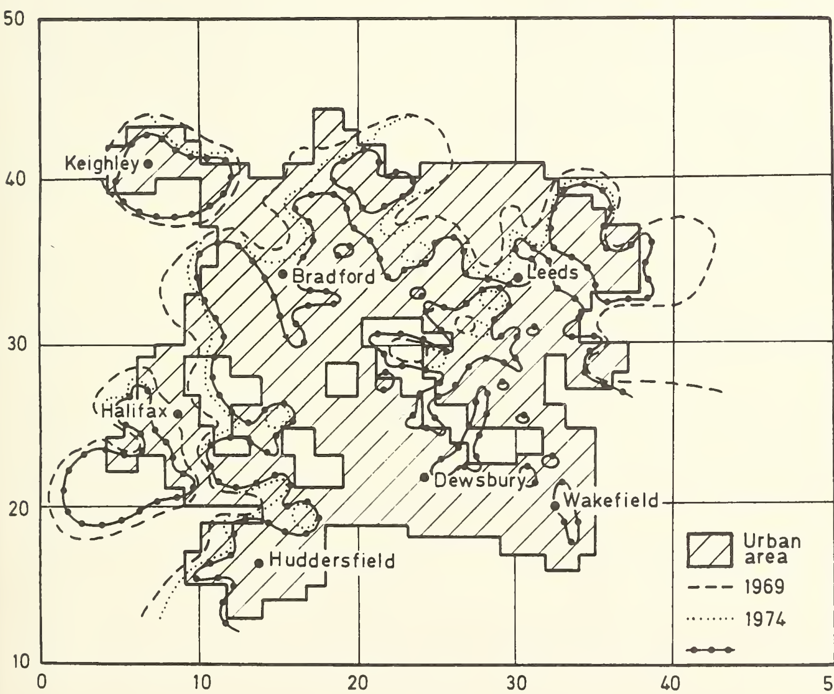

FIGURE 4
West Yorkshire conurbation: major distribution (inner limits) of *Lecanora muralis* in 1969, 1974 and 1979.

Micarea botryoides (Nyl.) Coppins
Henderson, 1980. M, U, V. On *Acer, Alnus, Betula*, and *Quercus*, Millstone grit and laminated sandstone. Overlooked and/or increasing in urban areas.

M. denigrata (Fr.) Hedl.
Add M, V.

M. sylvicola (Flotow) Vězda and V. Wirth
Earland-Bennett, 1977. T. On Millstone grit boulder in stream. Rare.

Ochrolechia turneri (Hoffm.) Arnold
Earland-Bennett, 1977. B. On Millstone grit boulders and exposed roots of *Quercus*. Rare.

Parmelia omphalodes (L.) Ach.
Delete (U), add U.

P. physodes (L.) Ach.
See *Hypogymnia physodes* (L.) Nyl.

P. subaurifera Nyl.
Add B; on *Salix* (one thallus c. 1 cm diam. in 1978; extinct in 1979).

P. sulcata Taylor
Add B, E: on *Salix* and *Ulmus*.

Pertusaria amara (Ach.) Nyl.
Delete T, add (T); collection on which modern record based is in fact *Trapelia coarctata* (Sm.) Choisy.

Phaeophyscia orbicularis (Necker) Moberg
Add I, J, L, R, S.

Physcia adscendens (Fr.) H. Oliver
Add B.

P. dubia (Hoffm.) Lettau
Add U.

P. orbicularis (Necker) Poetsch
See *Phaeophyscia orbicularis* (Necker) Moberg

P. tenella (Scop.) DC.
Add B, S.

Placynthium nigrum (Huds.) Gray
Add M; on calcareous gravestone. Rare.

Polysporina simplex (Davies) Vězda
Earland-Bennett, 1976. T. On coping of Millstone grit wall. Rare.

Ramalina farinacea (L.) Ach.
Delete (G), add G; on *Salix* by canal.

Rhizocarpon geographicum (L.) DC.
Add U.

R. obscuratum (Ach.) Massal.
Add U. Delete var. *reductum* record (Seaward, 1978, p. 75) since variety no longer recognized.

Rinodina exigua (Ach.) Gray
Add T; on decorticate bole of *Sambucus*.

R. gennarii Bagl.
Add E, I, L, N.

R. subexigua (Nyl.) H. Olivier
See *R. gennarii* Bagl.

Sarcogyne simplex (Davies) Nyl.
See *Polysporina simplex* (Davies) Vězda

Scoliciosporum chlorococcum (Graewe ex Stenhammar) Vězda
Add N.

S. umbrinum (Ach.) Arnold
Add B, L. Rarely corticolous.

Strangospora moriformis (Ach.) Stein
Add B, D; on *Acer* at both localities.

S. pinicola (Massal.) Körber
Earland-Bennett, 1976. T. On decorticate bole of *Sambucus*. Rare.
Trapelia involuta (Taylor) Hertel
Add M.
T. obtegens (Th.Fr.) Hertel
Earland-Bennett, 1976. G, M, R, T, U. On 'black-lime' mortar, siltstone wall, and canvas. Increasing in urban areas. Occasional.
Verrucaria hochstetteri Fr.
Add G.
V. hydrela Ach.
Add U; on siliceous stone in stream.
V. muralis Ach.
Add L.
V. nigrescens Pers.
Add B.
V. praetermissa (Trevisan) Anzi
Earland-Bennett, 1977. T. On quartzite boulder in stream. Rare.
V. viridula (Schrader) Ach.
Add I, L.
Xanthoria parietina (L.) Th. Fr.
Add O.

As a consequence of the above work, the lichen flora of the West Yorkshire conurbation can be summarized as follows: 318 lichen taxa have been reported from the area within 20 km of the centre of the conurbation, of which five are doubtful in the absence of supporting herbarium material, at least thirty-two are extinct in the area, and 179 have been recorded during the present survey (October 1967 — December 1980).

Acknowledgements

Thanks are due to Mr P. M. Earland-Bennett and Mr A. Henderson for providing me with their field records, and also to the latter for his helpful criticism of a draft manuscript of this paper.

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G. H. AINSWORTH

George Henry Ainsworth died suddenly in Hull at the age of seventy-seven on 18 September 1980 following a heart attack. With his passing we lose another of the founder members of the Bird Observatory at Spurn. He will best be remembered for the great part he played in establishing the Observatory.

From the time he was a boy living in Scarborough and Bridlington he was interested in birds. This interest continued and he was very active in the East Riding from the mid-1930s, teaming up with John Lord, a fellow member of the staff at Malet Lambert School, Hull: they formed a very successful partnership. George joined the Yorkshire Naturalists' Union in 1940 and was Joint Recorder of Birds for the East Riding with John Lord from 1942 to 1948, continuing as Recorder until 1951.

In the early 1940s when the area was closed to the public he got permission from the War Department to visit Spurn. This really began his close association with the Peninsula. Soon after the end of the Second World War in 1945, the Bird Observatory was set up, mainly at his instigation, and his drive and enthusiasm at a difficult time ensured that the Observatory was firmly established. He became its first secretary, continuing until 1962 and remaining as a member of the Committee until he resigned in 1972 through ill-health. Although he continued to take an interest in Spurn after 1972, he concentrated on his life-long hobby of stamp-collecting and, latterly, resumed his early interest in river fishing.

In 1972 the Yorkshire Naturalist's Union conferred Honorary Life Membership on him in recognition of his services to the Union, an honour that particularly pleased him. An appreciation of GHA, as he was known to so many of his ornithological friends, and his work at Spurn appeared in *The Naturalist*, 1973, p. 75 on the occasion of his being made an Honorary Life Member.

His many friends in the Union and at Spurn extend their sympathy to his widow Marion, his daughters Joan and Doreen and his son John in their time of bereavement.

JC

1981 ROYAL SOCIETY CONVERSAZIONE

Perhaps the most attractive exhibit to the naturalist in this year's Royal Society Conversazione was a large aquarium full of beautiful living coelenterates and reef fishes. In the modern manner, it was 'under-explained'; no names of species were given, though the easily recognized clownfish (*Amphiprion* sp.) was mentioned because of its immunity to being stung by sea anemones. The research described was concerned with the mechanism of cellular recognition in coelenterates; this is so 'specific' in the sea anemone *Anthopleura elegantissima* that individuals of different clones of the same species will attack one another. Most of the biological exhibits dealt with physiology and involved advanced experimental techniques such as embryo transfer in the study of reproduction in mammals and isolating single photoreceptors from the mammalian retina and stimulating them with single photons. Of more immediate potential practical interest was a demonstration of polymerizing crude oil with such substances as amine alcohols which have low toxicity and could be used to solidify oil spills into a flexible non-sticky solid. Of botanical interest was an exhibit about the accumulation of heavy metals in plants, such as gold in *Phacelia sericea* and nickel in *Dicoma niccolifera*. Possibly such plants could aid mineral prospectors, and a study of the way in which they convert metals into nontoxic substances might lead to the development of new ways of extracting them from low-grade deposits.

FHB

PLANTS OF THE RIVER TYNE SYSTEM BEFORE THE KIELDER WATER SCHEME

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SUMMARY

An account is given of partial surveys of the macrophytes of the North Tyne, South Tyne and Tyne. The data are presented in a manner which will permit the monitoring of changes taking place as a result of the regulatory Kielder Reservoir.

INTRODUCTION

The construction of large regulatory reservoirs can lead to obvious changes in the vegetation of the downstream river (Ridley and Steele, 1975). Such changes have already been noted in the Tees since the construction of Cow Green Reservoir (Holmes and Whitton, 1977a). The completion of the Kielder Reservoir on the Kielder Burn, the main tributary of the North Tyne, provides a further opportunity to monitor such changes. Surveys of the North Tyne and Tyne have already been reported (Holmes *et al.*, 1972), but these included only the lowermost 10 km of the North Tyne and only plants which are at least partially submerged even under conditions of low flow. The present account summarizes the distribution of macrophytes found in the river or on the immediate water's edge and parts of the South Tyne and Tyne in 1975, before the construction of the reservoir.

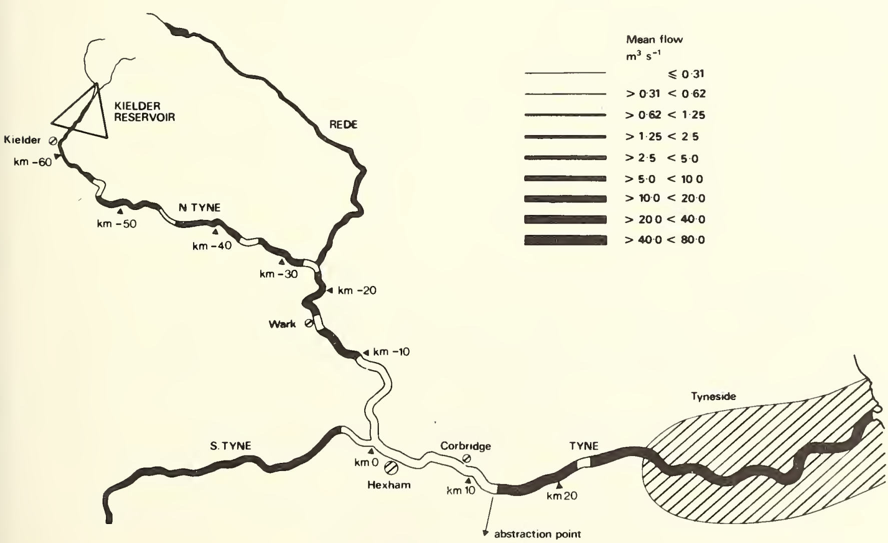

FIGURE 1

Map of the North Tyne and Tyne. Unshaded parts represent stretches of river surveyed. Map is redrawn from River Pollution Survey, England and Wales 1975 (Department of the Environment and Welsh Office, 1978) by permission of HMSO.

[1] Present address: Nature Conservancy Council, Godwin House, George Street, Huntingdon, Cambridgeshire.

METHODS

The methods are in general similar to those already used for surveys of the rivers to which water will be transferred from the Tyne (Wear: Holmes and Whitton, 1977c; Tees: Holmes and Whitton, 1977a) or to which it had originally been intended to transfer water (Swale: Holmes and Whitton, 1977b). Key features are the listing of all species of macrophyte in a 0.5 km length of river at one particular time, careful checking for presence or absence against a check-list and the separation of records according to whether they refer to the 'bank' or 'river'. Unlike some of the other surveys, the present one included only selected 0.5 km lengths (Fig 1, Table 1); it was carried out in August 1975. Records of the geographical limits of each length and the estimate of cover of each species are held at Durham University, Northumbrian Water Authority, and Nature Conservancy Council (Huntingdon) and may be obtained from the authors.

TABLE 1

List of sections of rivers for which each 0.5 km length surveyed. Distances are measured upstream (—) from junction of North Tyne and South Tyne and downstream for the main Tyne.

North Tyne	km	— 46.0 to — 44.0
		— 36.0 to — 34.0
		— 26.0 to — 24.0
		— 16.0 to — 14.0
		— 10.0 to — 0.0
Tyne	km	0.0 to 15.0
	km	24.0 to 26.0
South Tyne	km	— 2.0 to – 0.0

RESULTS AND DISCUSSION

The distribution of species is shown in Figs 2–8.

North Tyne

The flora of the North Tyne reflects the fast currents and predominantly rocky substratum typical of much of the river. In the upper stretches *Ulothrix zonata* and mosses were dominant, with *Myriophyllum alterniflorum* also present as far upstream as the survey went. From km — 25.0 downstream *Potamogeton crispus*, *Ranunculus penicillatus* var. *calcareus* and *Elodea canadensis* were all present; the dominant species in this stretch was however *Rhynchostegium riparioides*, with *Fontinalis antipyretica* and *Cladophora glomerata* frequent. *Potamogeton pusillus* was not recorded, although small fragments were reported in 1972 (Holmes *et al.*, 1972).

FIGURES 2–8 (Pages 99–105)

Distribution of macrophytes in North Tyne and Tyne based on number of records of presence of species in 0.5 km lengths of particular sections of river. Records above the horizontal line refer to 'bank' and those below the line to 'river'. Authorities for species are given by Whitton *et al.* (1978) and Holmes *et al.* (1979). (Bryophytes are not in strict alphabetical order due to nomenclatural changes since production of check-list used for surveys.)

Estimates of area cover: ☐ ⩽ 0.1% ▨ >0.1⩽ 1% ■ > 1%.

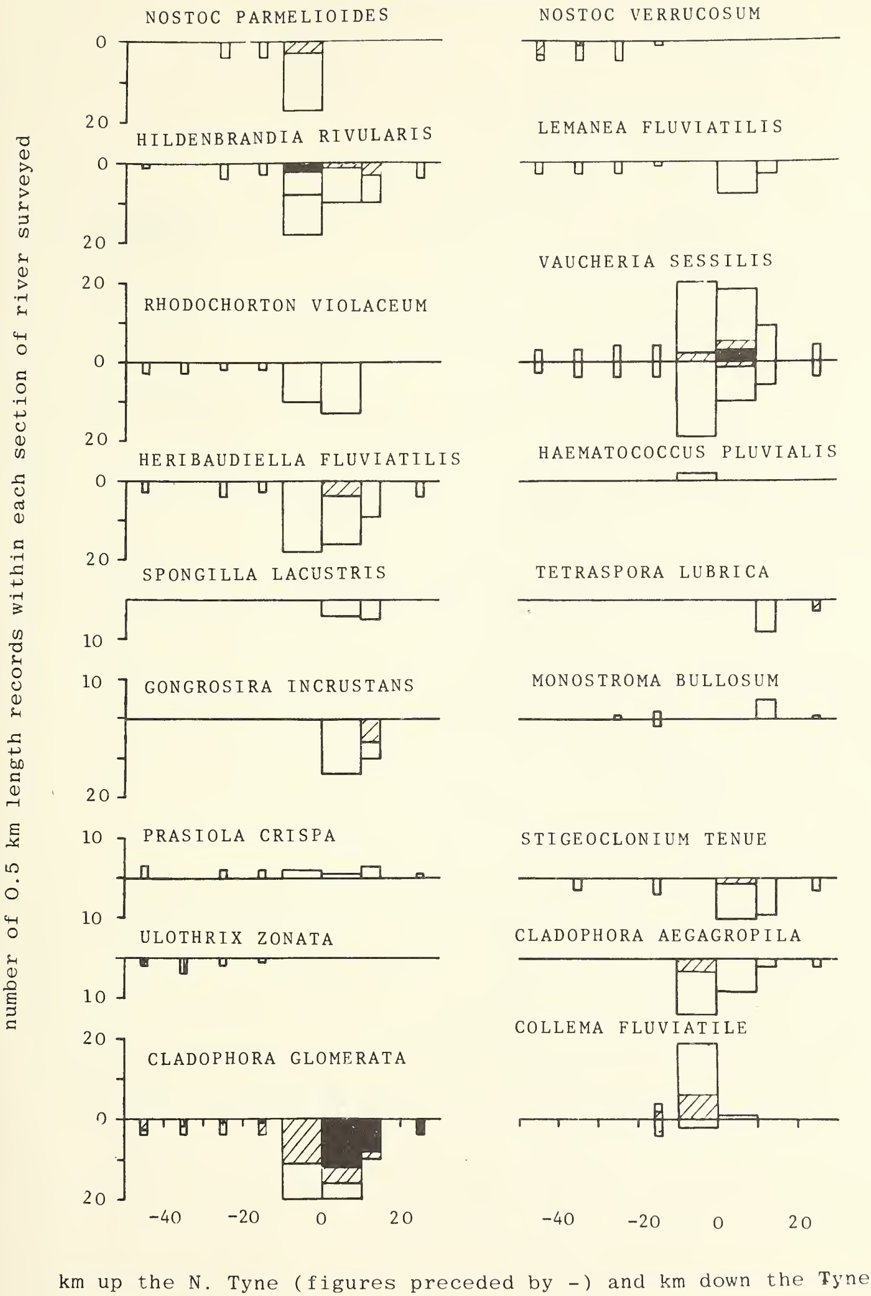
NOSTOC PARMELIOIDES
NOSTOC VERRUCOSUM
HILDENBRANDIA RIVULARIS
LEMANEA FLUVIATILIS
RHODOCHORTON VIOLACEUM
VAUCHERIA SESSILIS
HERIBAUDIELLA FLUVIATILIS
HAEMATOCOCCUS PLUVIALIS
SPONGILLA LACUSTRIS
TETRASPORA LUBRICA
GONGROSIRA INCRUSTANS
MONOSTROMA BULLOSUM
PRASIOLA CRISPA
STIGEOCLONIUM TENUE
ULOTHRIX ZONATA
CLADOPHORA AEGAGROPILA
CLADOPHORA GLOMERATA
COLLEMA FLUVIATILE
number of 0.5 km length records within each section of river surveyed
0
10
20
-40
-20
0
20
km up the N. Tyne (figures preceded by -) and km down the Tyne

FIGURE 2

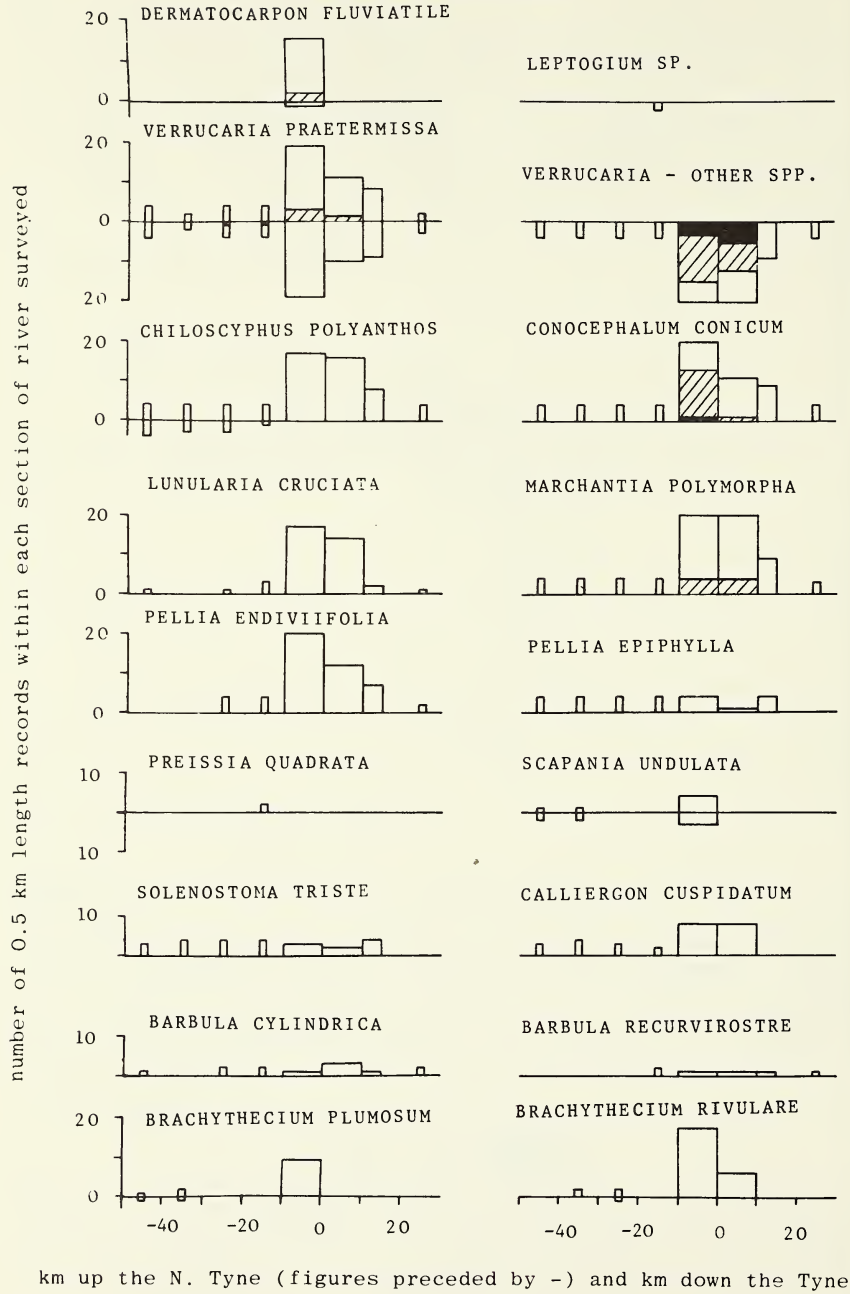
DERMATOCARPON FLUVIATILE
LEPTOGIUM SP.
VERRUCARIA PRAETERMISSA
VERRUCARIA - OTHER SPP.
CHILOSCYPHUS POLYANTHOS
CONOCEPHALUM CONICUM
LUNULARIA CRUCIATA
MARCHANTIA POLYMORPHA
PELLIA ENDIVIIFOLIA
PELLIA EPIPHYLLA
PREISSIA QUADRATA
SCAPANIA UNDULATA
SOLENOSTOMA TRISTE
CALLIERGON CUSPIDATUM
BARBULA CYLINDRICA
BARBULA RECURVIROSTRE
BRACHYTHECIUM PLUMOSUM
BRACHYTHECIUM RIVULARE
number of 0.5 km length records within each section of river surveyed
-40 -20 0 20
km up the N. Tyne (figures preceded by -) and km down the Tyne

FIGURE 3

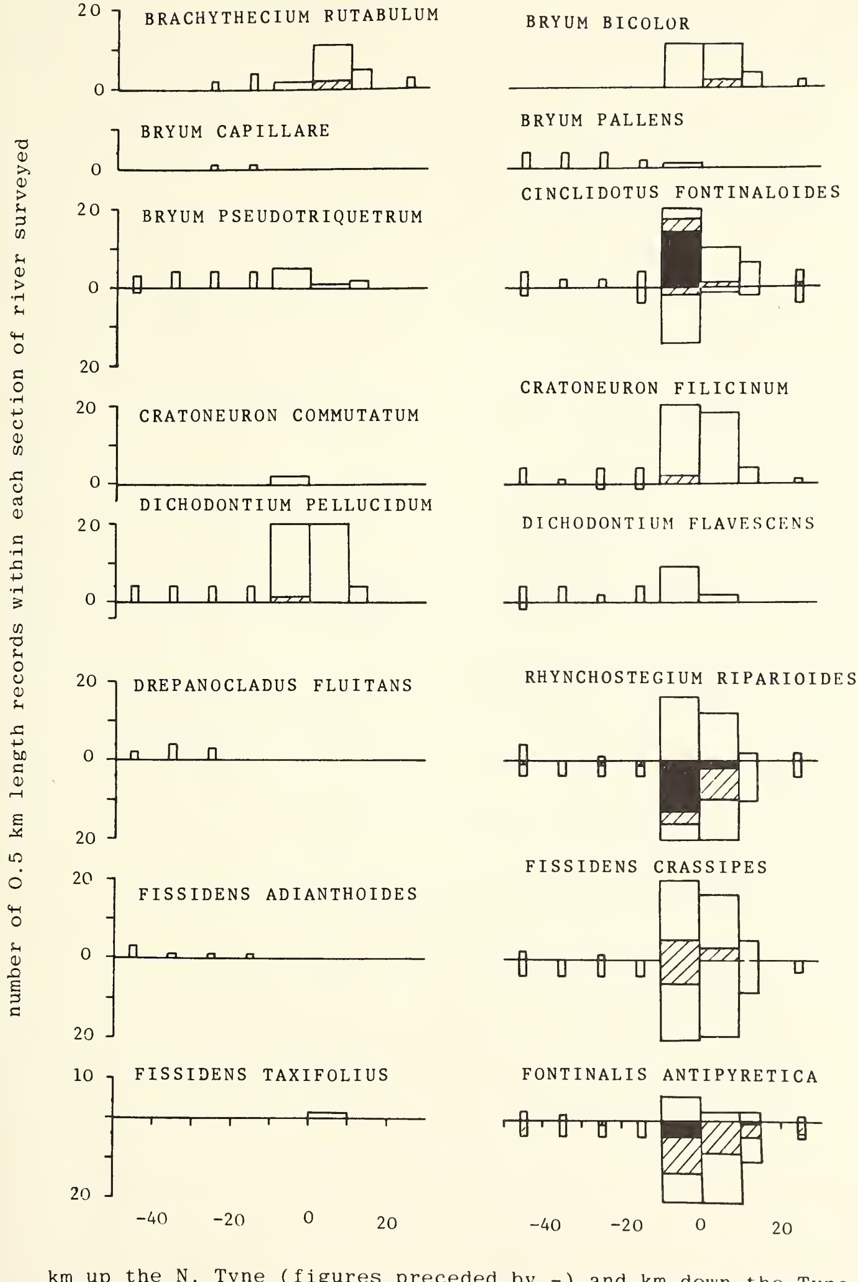
number of 0.5 km length records within each section of river surveyed
BRACHYTHECIUM RUTABULUM
BRYUM BICOLOR
BRYUM CAPILLARE
BRYUM PALLENS
CINCLIDOTUS FONTINALOIDES
BRYUM PSEUDOTRIQUETRUM
CRATONEURON FILICINUM
CRATONEURON COMMUTATUM
DICHODONTIUM PELLUCIDUM
DICHODONTIUM FLAVESCENS
DREPANOCLADUS FLUITANS
RHYNCHOSTEGIUM RIPARIOIDES
FISSIDENS CRASSIPES
FISSIDENS ADIANTHOIDES
FISSIDENS TAXIFOLIUS
FONTINALIS ANTIPYRETICA
20
0
10
-40
-20
0
20
km up the N. Tyne (figures preceded by -) and km down the Tyne

FIGURE 4

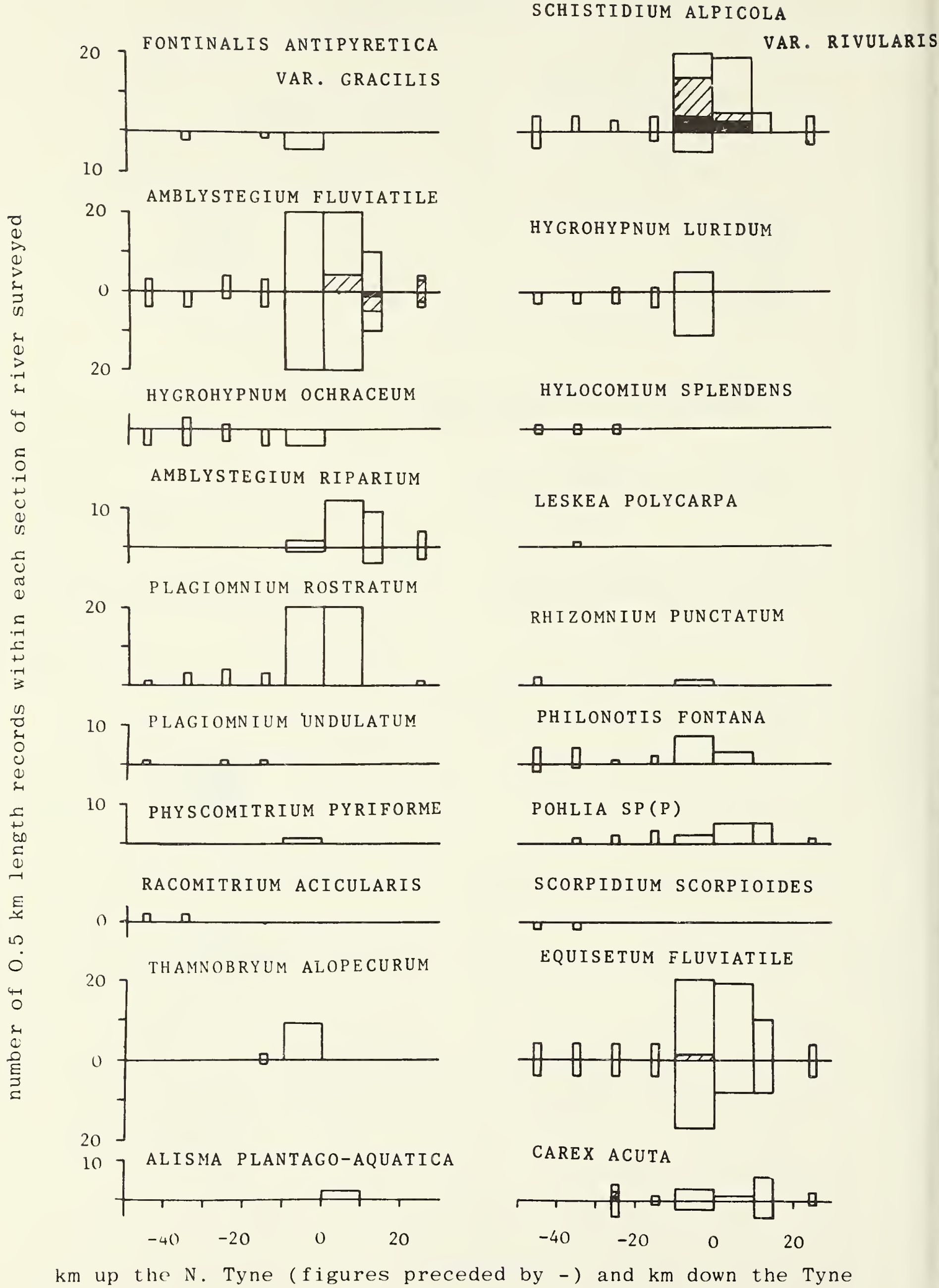
FONTINALIS ANTIPYRETICA
VAR. GRACILIS
AMBLYSTEGIUM FLUVIATILE
HYGROHYPNUM OCHRACEUM
AMBLYSTEGIUM RIPARIUM
PLAGIOMNIUM ROSTRATUM
PLAGIOMNIUM UNDULATUM
PHYSCOMITRIUM PYRIFORME
RACOMITRIUM ACICULARIS
THAMNOBRYUM ALOPECURUM
ALISMA PLANTAGO-AQUATICA
SCHISTIDIUM ALPICOLA
VAR. RIVULARIS
HYGROHYPNUM LURIDUM
HYLOCOMIUM SPLENDENS
LESKEA POLYCARPA
RHIZOMNIUM PUNCTATUM
PHILONOTIS FONTANA
POHLIA SP(P)
SCORPIDIUM SCORPIOIDES
EQUISETUM FLUVIATILE
CAREX ACUTA
number of 0.5 km length records within each section of river surveyed
-40
-20
0
20
km up the N. Tyne (figures preceded by -) and km down the Tyne

FIGURE 5

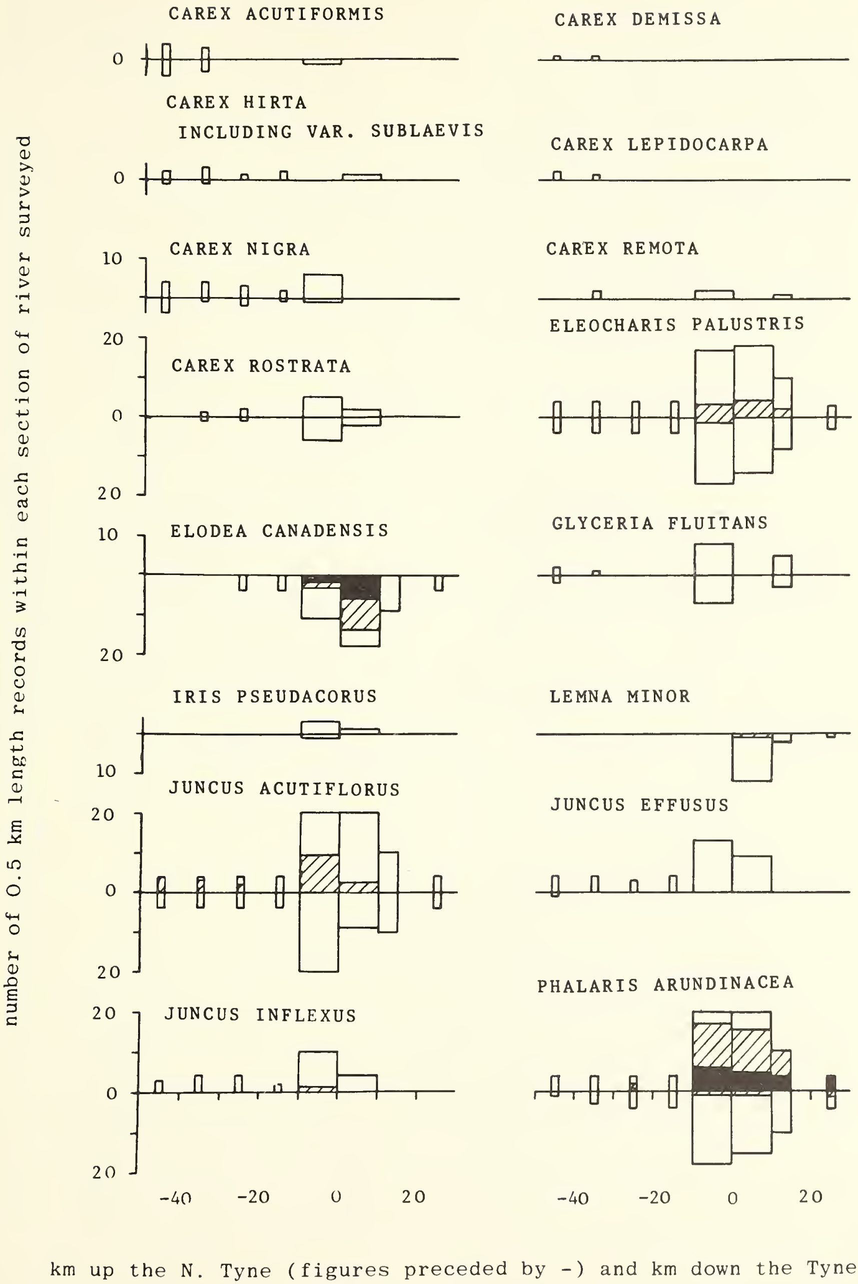
CAREX ACUTIFORMIS
CAREX DEMISSA
CAREX HIRTA
INCLUDING VAR. SUBLAEVIS
CAREX LEPIDOCARPA
CAREX NIGRA
CAREX REMOTA
ELEOCHARIS PALUSTRIS
CAREX ROSTRATA
ELODEA CANADENSIS
GLYCERIA FLUITANS
IRIS PSEUDACORUS
LEMNA MINOR
JUNCUS ACUTIFLORUS
JUNCUS EFFUSUS
PHALARIS ARUNDINACEA
JUNCUS INFLEXUS
number of 0.5 km length records within each section of river surveyed
0
10
20
-40
-20
0
20
km up the N. Tyne (figures preceded by -) and km down the Tyne

FIGURE 6

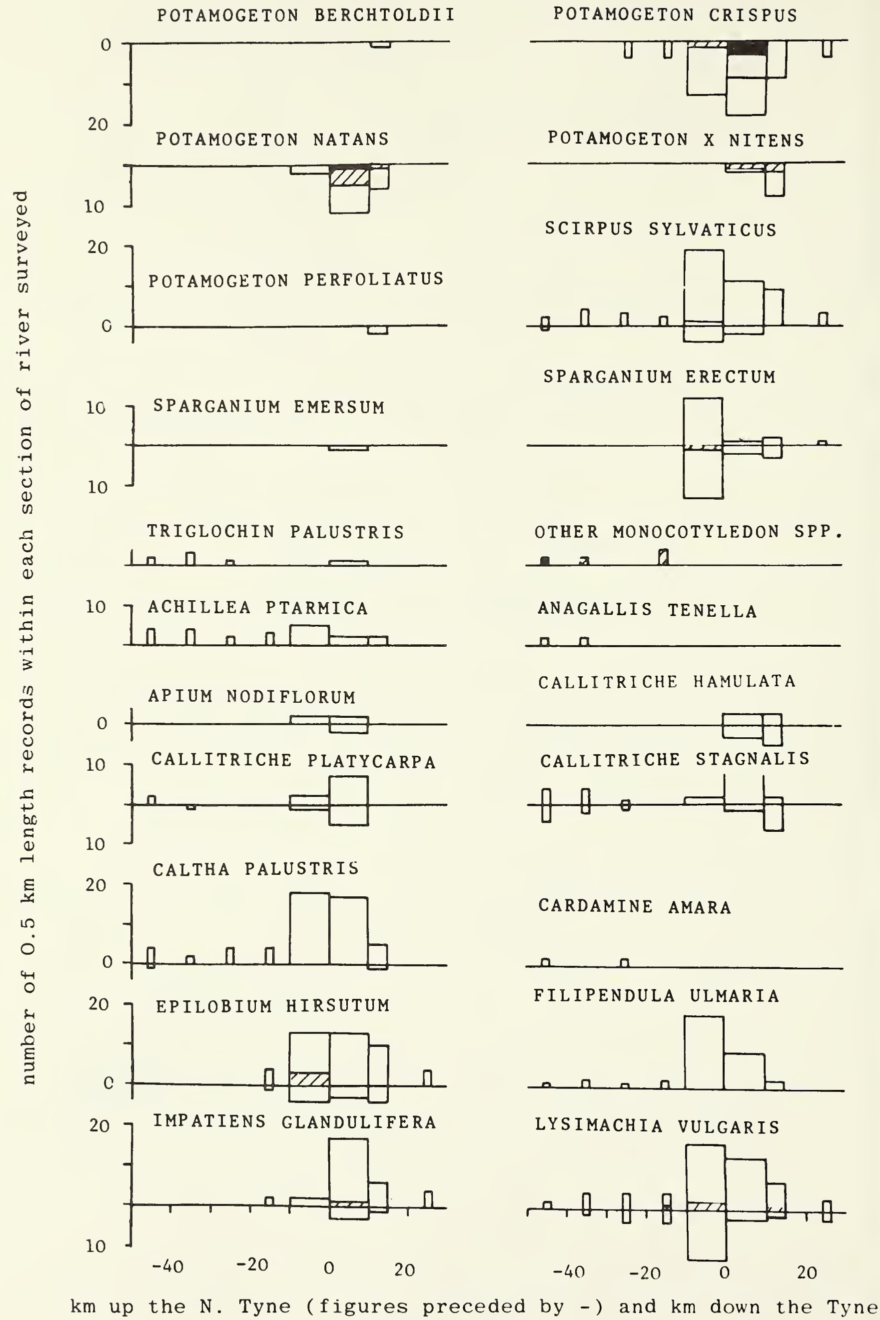
POTAMOGETON BERCHTOLDII
POTAMOGETON CRISPUS
POTAMOGETON NATANS
POTAMOGETON X NITENS
SCIRPUS SYLVATICUS
POTAMOGETON PERFOLIATUS
SPARGANIUM ERECTUM
SPARGANIUM EMERSUM
TRIGLOCHIN PALUSTRIS
OTHER MONOCOTYLEDON SPP.
ACHILLEA PTARMICA
ANAGALLIS TENELLA
CALLITRICHE HAMULATA
APIUM NODIFLORUM
CALLITRICHE PLATYCARPA
CALLITRICHE STAGNALIS
CALTHA PALUSTRIS
CARDAMINE AMARA
EPILOBIUM HIRSUTUM
FILIPENDULA ULMARIA
IMPATIENS GLANDULIFERA
LYSIMACHIA VULGARIS
number of 0.5 km length records within each section of river surveyed
0
20
10
-40
-20
0
20
km up the N. Tyne (figures preceded by -) and km down the Tyne

FIGURE 7

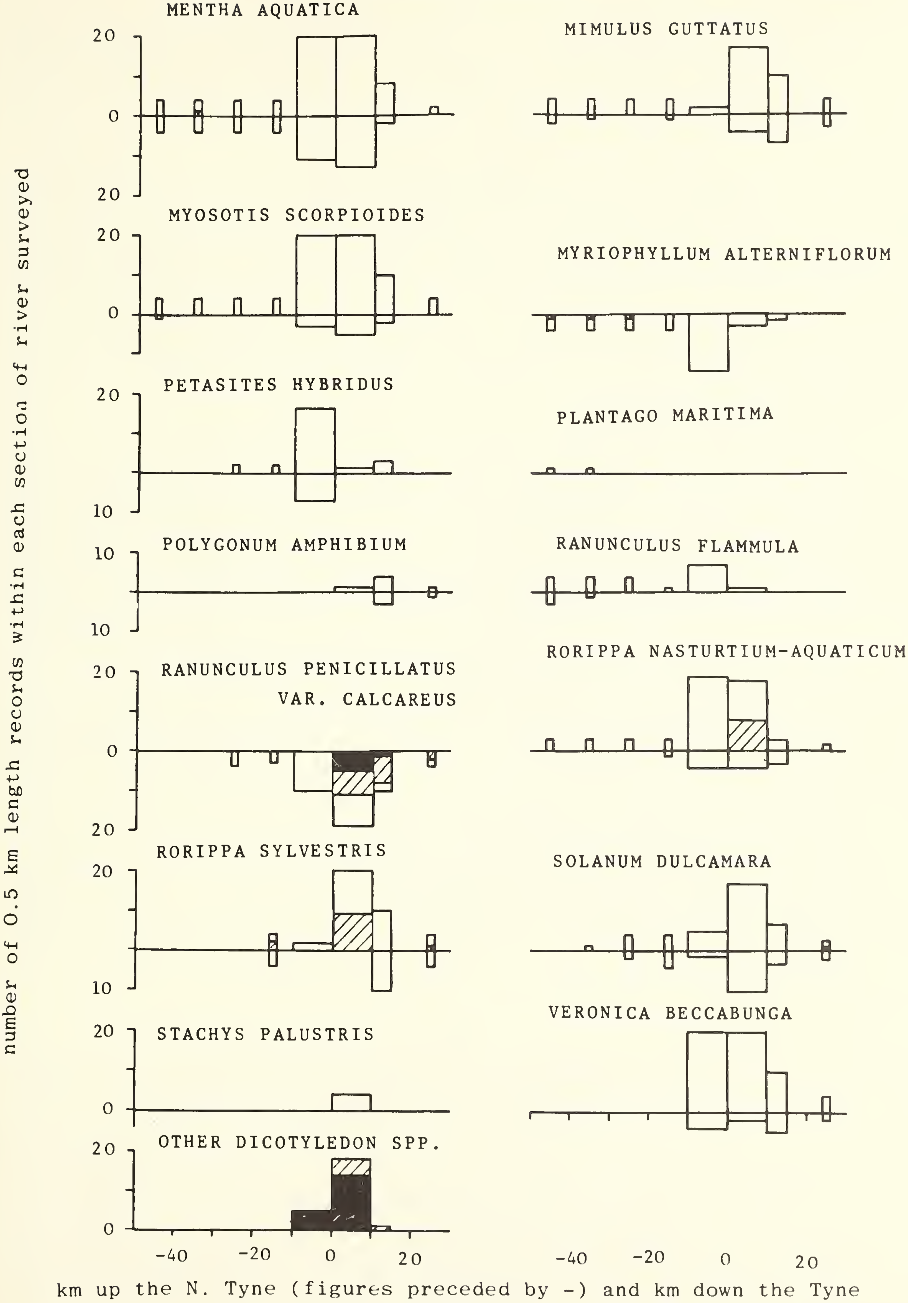
MENTHA AQUATICA
MIMULUS GUTTATUS
MYOSOTIS SCORPIOIDES
MYRIOPHYLLUM ALTERNIFLORUM
PETASITES HYBRIDUS
PLANTAGO MARITIMA
POLYGONUM AMPHIBIUM
RANUNCULUS FLAMMULA
RANUNCULUS PENICILLATUS VAR. CALCAREUS
RORIPPA NASTURTIUM-AQUATICUM
RORIPPA SYLVESTRIS
SOLANUM DULCAMARA
STACHYS PALUSTRIS
VERONICA BECCABUNGA
OTHER DICOTYLEDON SPP.
20
0
20
10
-40
-20
0
20
number of 0.5 km length records within each section of river surveyed
km up the N. Tyne (figures preceded by -) and km down the Tyne

FIGURE 8

South Tyne

No species were present in the section surveyed which were not present also in one or both of the other rivers. At the time of the survey about 5 per cent of the river was covered by *Cladophora*. The substratum is very variable and macrophytes occur as individual plants or in small slumps and never in large beds.

Tyne

The distribution of species was in general similar to that found in 1972. A few further species were however recorded. *Cladophora aegagropila* and *Heribaudiella fluviatilis* were almost certainly present in 1972 but not recognized. The record of *Potamogeton perfoliatus* in 1975 fulfils the prediction made in 1972 that its presence somewhere in the catchment was likely, since the hybrid *P. perfoliatus* X *P. gramineus* (*P.* X *nitens*) was frequent. The other parent, *P. gramineus* has been recorded within the South Tyne catchment (late J. E. Dandy, pers. comm. 1972), so perhaps *in situ* hybridization has taken place within the Tyne catchment. *Potamogeton berchtoldii* was probably overlooked in 1972, although it could have spread recently from the lower part of River Derwent (downstream tributary of Tyne), where large stands were present in 1975.

Species notable for their absence

In the Tweed (Holmes and Whitton, 1975), Wear (Holmes and Whitton, 1977c), Tees (Holmes and Whitton, 1977a) and similar rivers throughout Britain (NTHH, unpublished), *Myriophyllum alterniflorum* is present in the upper, faster-flowing, more oligotrophic waters, but replaced downstream by *M. spicatum*. Although *M. alterniflorum* disappears in the middle reaches of the Tyne (Fig 7), there is no simultaneous occurrence of *M. spicatum*. *Potamogeton pectinatus*, another downstream species of the Tweed, Wear, Tees, Swale, and other rivers in NE England has never been recorded from the Tyne catchment (late J. E. Dandy, pers. comm. 1973). Other downstream species of the Tweed, Tees and Swale but absent in the Tyne are *Enteromorpha flexuosa* and *Ranunculus fluitans*.

It is essential to know whether a particular species is present or absent in a river prior to major changes in its management if its impact is going to be monitored accurately. The data above suggest that a number of species which might be expected to occur in the Tyne system have not been recorded. Chance thus plays an important role in determining the distribution of many species. River regulation in a river such as the Tyne is more likely to produce a change in the distribution and abundance of species already present in the catchment than to induce a major invasion by other species. The most likely invader is *Elodea nuttallii*, a plant of uncertain taxonomy, which in the last five years has spread from East Anglia to many counties as far apart as Hampshire and Cumbria. The records include Billingham Beck, Co. Durham (G. G. Graham, pers. comm. September 1980). If this species does invade the river it is a change in the flora which cannot be attributed to its regulation.

ACKNOWLEDGEMENTS

We are grateful to the Natural Environment Research Council for financial support for a study of the possible effects of the water transfer scheme on river vegetation.

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Holmes, N. T. H. and Whitton, B. A. (1977a) The macrophytic vegetation of the River Tees in 1975: observed and predicted changes. *Freshwat. Biol.* **7**: 43–60.

Holmes, N. T. H. and Whitton, B. A. (1977b) Macrophytic vegetation of the River Swale, Yorkshire. *Freshwater Biol.* 7: 545–58.

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Holmes, N. T. H., Whitton, B. A. and Hargreaves, J. W. (1979) *A Coded List of Freshwater Macrophytes of the British Isles. Lichens — Bryophytes — Vascular Plants.* Water Archive Manual Series No. 4. Department of the Environment, Reading.

Ridley, J. E. and Steele, J. A. (1975) Ecological aspects of river impoundments. In: Whitton B.A. (ed.) *River Ecology*, pp. 565–87. Blackwell, Oxford.

Whitton, B. A., Holmes, N. T. H. and Sinclair, C. (1978) *A Coded List of 1000 Freshwater Algae of the British isles*. Water Archive Manual Series No. 3. Department of the Environment Reading.

BOOK REVIEWS

The Birdwatchers A — Z by **Alan J. Richards**. Pp. 328, with many photographs and drawings. David & Charles, Newton Abbot. 1980. £14.95.

My first thoughts on seeing this book were that it was probably another incomplete commercial enterprise. These thoughts were soon dispelled and it is in fact a very good publication which more than adequately fulfils its claim. Profusely illustrated and including most of the obscure terms which we often hear but never quite know the exact meaning of and all the fashionable lingo of the modern birdwatcher, it is a working counterpart of Landsborough Thompson's *New Dictionary* and I would recommend it to anyone with an ornithological bent.

JRM

A Field Guide to the Birds of East Africa by **J. G. Williams** and **N. Arlott**. Pp. 415, with many colour plates. Collins. 1980. £7.95.

A Field Guide to the Birds of Australia by **G. Pizzey**. Pp. 460, with many colour and black and white plates. Collins. 1980. £12.50.

Two excellent books from the Collins stable which adequately supersede what has gone before. The first, on East Africa, is an update of the 1963 original but is in fact much more, with far better new plates by Arlott. No-one could fail to find their way around the East African birds with this work. The second, on Australian birds, is certainly the most complete guide available since Neville Cayley's *What Bird is That?*, which surprisingly fails to get a mention in the introduction. With Australia only £550 away, every serious birdwatcher should buy it. The plates by Roy Doyle are excellent.

JRM

Birds of Prey of the World by **Friedhelm Weick** and **Leslie H. Brown**. Pp. 159, with numerous colour plates. Collins. 1980. £15.

This book was inspired by Peter Scott's *Coloured Key to the Wildfowl of the World* and fails. Published with German and English text, the whole depicts the diurnal raptores in stiff, perched ranks across the page, which was fine for Eider Ducks and Mallards but just doesn't work for birds of prey. This notoriously difficult group, the majority of which are seen and identified in flight, does not lend itself to this treatment and those who find birds of prey difficult will be in exactly the same position, or worse after reading and perhaps more importantly, looking at, this book. Those, and there are many, who rely on the vernacular will also find life difficult. It is certainly well produced and is the result of 'more than a decade of labour', but as an aid to identification, treat it with reserve.

JRM

Birds of Africa. A Bird Photographer in East Africa by **John Karmali**. Pp 191. Collins, 1981. £12.50.

John Karmali is an amateur photographer who lives in Kenya. This book consists of 72 colour and over 140 black and white photographs, linked by an intelligent text. For anyone interested in East African birds it must surely represent good value. There is a brief introduction outlining the zoogeographic regions and East Africa's place among them, with maps of relief and vegetation. Then the author works systematically through his selection of 37 families of birds, starting with ostriches and pelicans and working through to weavers and starlings. The pictures are mostly portraits, and very good ones; the text covers taxonomy briefly and ecology — very readably — at greater length. The book ends with nine pages of technical notes on how the colour plates were photographed, and a useful bibliography and index. A delightful book, expensive but not overpriced.

BS

Flowers of Greece and the Balkans. A Field Guide by **Oleg Polunin** Pp. xvi + 592 (including numerous line drawings), plus 80 pp. of full colour plates. Oxford University Press. 1980. £40.

The introductory section gives a lucid account (with maps) of the diverse climate and topography to be encountered in the botanically rich area comprising Greece and its islands, Yugoslavia, Bulgaria, Albania, and north-west Turkey. This area supports more than 6500 species of flowering-plant, of which 1750 plus are Balkan endemics and of these about half are extremely local.

The next section provides an excellent guide to the outstanding plant-hunting regions, giving particular attention to accessibility and the major environmental factors, including past and present agricultural practices, responsible for the character of today's flora. The text is supported by colour plates of the terrain and line drawings of typical plants.

The major section of the book is devoted to descriptions of almost 3000 plants, supported by further line drawings of entire or part plants and 64 pages of splendid colour plates illustrating 461 species. Keys to genera and species are also provided for many plants. It is helpful in numerous cases to cross-reference to Polunin's *Flowers of Europe*, which gives supplementary information and employs the same numbering arrangement for species. These two works together with Polunin and Smythies' *Flowers of South-west Europe* comprehensively cover the north Mediterranean flora. All works are essentially non-academic, being aimed at the amateur naturalist, the botany student and the holiday-maker; in addition, there is much of interest for the gardening enthusiast.

We are indebted to Oleg Polunin for providing easy-to-use plant identification guides in English for use in foreign parts and commend the publishers for the high standard of presentation but not for the high price charged which will certainly reduce the book's potential usefulness.

MRDS

Excursion Flora of the British Isles by **A. R. Clapham, T. G. Tutin** and **E. F. Warburg**. Pp. xxxiii + 499, including 8 figures. Cambridge University Press. 1981. 3rd edition. £12.50.

Completely revised and expanded edition (2nd edn. 1968) of the indispensable guide for the field botanist: the new format, with plastic covers and larger pages (23 cm × 12 cm), caters for a more detailed treatment of certain taxonomically-difficult groups and a more precise indication of distribution for many species. The elongate form of the book, however, is awkward to shelve or to carry in any but the deepest of pockets. The strength of the work lies mainly in its keys, which include almost all the native, many naturalized and a few casual species. The descriptions treat all species common in lowland districts of the British Isles and some rarer species likely to be found near field centres, etc. A model of accuracy and conciseness, without sacrificing clarity.

Richard Bell's Britain. Pp. 192, with coloured illustrations. Collins. 1981. £9.95.

The latest in a spate of coloured sketchbooks, generated no doubt by the success of *The Country Diary of an Edwardian Lady* by Edith Holden (1977). This is a charming presentation of the British countryside by the Yorkshire-based illustrator and writer, but it is short on natural history, being liberally peppered with question marks and with such comments as 'which I thought might have been . . .', 'could this have been . . .', and 'some kind of . . .'.

JETHRO TINKER (1788–1871) — FIELD NATURALIST BY THE LATE THE REV. N. DENNIS, S.J.

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When his untimely death in September 1966 left the work unfinished, the Rev. Norman Dennis, s.j., was gathering material towards a paper on Jethro Tinker. Since he had not drawn up a preparatory draft, we have edited his notes and present them here in the form of a short account of Tinker, his collections and their fate, as far as that has been ascertained. The paper must, of course, be credited to the author of the notes.

Jethro Tinker was born on 25 September 1788 in a cottage at 'North Britain', the Brushes, Stalybridge; the farm and buildings of North Britain Farm later covered the site of the cottage (Hill, 1907). Later still, the farmhouse and buildings were demolished when the ground was cleared by the waterworks authority (Bradshaw, 1945).

As a boy, Tinker worked on the moors above Hollingworth shepherding for a Mr Gartside of Thorncliffe Hall, Hollingworth (Hill, 1907). It was perhaps during this period that he became interested in natural history, especially botany, a study in which he was encouraged by John Bradbury (1768–1823) a Stalybridge naturalist (Hill, 1907; Bradshaw, 1945). About 1806, the Tinker family moved to Mottram, where Jethro became a hand-loom weaver, but two years later he moved to the valley after the introduction of power-looms to Stalybridge. From operative weaver, Tinker became overlooker and eventually manager at Cheetham Mills but then gave up weaving, becoming in turn shopkeeper, publican and finally gardener at Eastwood, a private house whose grounds now form part of a public park. It is of interest, however, that his name appears among lists of neither publicans nor gardeners in the Post Office Directory for Cheshire of 1857.

Bradshaw (1945), who has written affectionately of Tinker, was born at 154 Brierley Street, Stalybridge, next door to the Tinker house, and well remembered the old naturalist going about in a blue smock (Dallman, 1945). A man of fine physique and even at eighty 'tall and straight-limbed', Tinker lived in his later years with his son-in-law William Worthington of Mottram Road, Stalybridge, and there he died on 10 March 1871 in his eighty-third year (Hill, 1907). He lies in Mottram churchyard, on the north side, his grave marked by a flat stone (Hill, 1907).

Soon after his death some friends and admirers erected a monument to Tinker in the form of a stone column which was set up on 18 July 1874 and which still stands in Stamford Park, Stalybridge. The inscription reads, 'Jethro Tinker, born 25th. September 1788, died 10th. March 1871. Our local Linnaeus. Erected by the friends and admirers of Natural History 1874. A field naturalist from early youth to old age'.

Throughout his life, he took an active interest in local natural history and in the botanical societies which flourished in the industrial north-west of England. Buxton (1849) wrote warmly of Tinker's probity and helpfulness, publishing many of his records of flowering plants and ferns. Local botanical discoveries made by Tinker were also recorded by Whitehead *et al.* (1888). As is evident from these accounts, he did not confine himself to flowering plants but was a good bryologist and also worked on the Mollusca and Lepidoptera. His achievements were recognized in his own lifetime when, in 1858, his fellow naturalists expressed their appreciation in the form of a public testimonial. As Hill (1907) recorded, he allowed no opportunity to pass of adding to his collection of butterflies, moths and shells. 'The Herbarium itself contains hundreds upon hundreds of specimens of the vegetation of the district, with notes in the handwriting of the gifted botanist detailing the date and place where they were gathered' (Hill, 1907). It is curious, however, that little seems to be known of Tinker's work on the Mollusca. His name does not appear in the Cheshire list (Oldham, 1896) or in the Lancashire list (Standen,

1887) of Mollusca. In Dyson (1850), there are two Brushes records, of *Ancylus fluviatilis* and *Clausilia 'nigricans'*, but there is no mention of Tinker, all of which rather suggests that the molluscs were of only minor interest to him.

The Brushes where Tinker collected so often was a wooded glen running up between the hills a couple of miles from Stalybridge and opening out upon the wild moorland at its head. However, his detailed local knowledge extended much further than this. For instance, there is an interesting account by William Wilson of a botanical ramble undertaken on 15 June 1832 by Wilson himself, Mr Crozier (doubtless George Crozier, 1792–1847) and Tinker, the account having been quoted by Cash (1887). The trio started from Greenfield in Saddleworth with Tinker acting as guide. He showed them both species of the filmy fern, *Hymenophyllum*, as well as *Arctostaphylos uva-ursi* and very many mosses and liverworts during a day in which they seem to have covered a great deal of ground.

After Tinker's death in 1871, his son-in-law, who was one of his executors, retained the herbarium for some years, and probably the other collections as well. During this period, J. G. Baker and F. M. Webb examined the flowering plants and extracted records for de Tabley's *Flora of Cheshire* (Warren, 1899).

Later, Tinker's herbarium and other collections were given to the Stamford Park Museum, Stalybridge (Hill, 1907), and their subsequent history is distressing. The museum was opened in Highfield House in 1874 and it was natural for Tinker's executors, anxious to have his valuable collections preserved, to present them to the local museum, then being actively developed. Unfortunately, their faith was sadly misplaced. In 1910, it was recorded (Beaumont, 1910) that the museum included 'Jethro Tinker's herbarium and entomological collection of insects' [*sic!*] but by 1915 the collections are stated (Bradshaw, 1945) to have been in a very poor state of preservation.

Highfield House, the museum building itself, was demolished in 1954. Inspecting the museum collections the following year, the Stalybridge Librarian found them to be in bad condition and very little was salvaged. According to one report, only one small picture was retained, but it would seem that at least some of the museum collections were kept and stored in the Stalybridge Public Library, although Kent's (1957) statement in respect of Jethro Tinker's herbarium was brief, 'Museum now closed and collections disposed of. Not traced'.

On 15 April 1966, the Rev. N. Dennis visited Stalybridge Library and was shown a herbarium of some 2000 sheets. He noted, 'Most of the plants were William Whitehead's (he lived at 26 High Street, Stalybridge, now demolished), but there were also plants from J. E. Sutherland of Hatherlow near Stockport and plants from the Botanical Exchange Club collected by various botanists. A valuable set of plants.' There was also a cardboard box labelled 'Musci (Mosses) Jethro Tinker & others (1821–1870)', which included specimens collected by S. Gibson (1790–1840), J. Nowell (1802–1867), F. Pill, D. Schofield, J. Whitehead (1833–1896). W. Wilson (1799–1871) and others. Father Dennis suggested that the handwriting on both box and specimens was that of W. Wilson. Newton (1980), however, has pointed out that the annotations on the mosses are not in the handwriting of William Wilson but, rather, that the 'W.W.' signature to notes is most probably that of William Whitehead. These mosses, fully treated of in Newton (1981), seem to be all that remains of Tinker's bryological herbarium. His herbarium of flowering plants has not been traced.

Of Tinker's entomological collections nothing is known and it seems probable that all have perished. His molluscan collection has also vanished, though Mrs H. C. Caffrey, Museum Officer to Tameside Metropolitan Borough, has tried locally in recent years to obtain further information on Tinker and the fate of his collections. It is nothing less than tragic that his valuable collections, well documented and of historic importance, have been so neglected and finally lost.

Acknowledgements

The papers on which this account is based were originally sent to Miss M. Scannell, Head of the Herbarium, National Botanic Gardens, Glasnevin, Dublin. We are grateful to her for putting them at our disposal. We are also grateful to Mrs Caffrey for her help and for supplying a copy of a Tinker label.

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THE BRYOPHYTE COLLECTIONS OF JETHRO TINKER (1788–1871)

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Jethro Tinker of Stalybridge, Cheshire, close to the old county boundaries of Lancashire, Yorkshire and Derbyshire, was a naturalist held in particularly high esteem by his contemporaries (Tinker, 1904; Hill, 1907). Not only was he a capable entomologist and botanist but many accounts bear testimony to his enthusiasm and helpfulness (Moore, 1842; Cash, 1887; Bradshaw, 1945). It is, therefore, surprising that his legacy of extensive natural history collections (Hill, 1907) should have fallen victim to apathy and, perhaps, to misfortune within forty or fifty years of his death (Bradshaw, 1945). Writing of a time more than thirty years earlier, Bradshaw (1945) blamed the municipal councils to which they had been entrusted for the sorry state in which Tinker's collections then were. Exactly what that state was is not known. What is known is that no more than a hundred or so mosses (Brill, 1963) now remain. Those few are, however, of considerable local interest.

The specimens are mounted individually on postcards and, as Dennis (1981) has observed, not all were collected by Tinker. Brill (1963) considered that all had been annotated by Tinker himself, whereas Dennis (1981) regarded the handwriting on the majority of specimens and, until 1976, on the box which held them as probably that of W. Wilson of Warrington. Both views are only superficially plausible and neither is correct.

Of the 124 specimens I examined in 1966 and again in 1976, fifty-six had been collected by Tinker, two of them jointly with D. Schofield. The remainder include several specimens without collecting details, as well as gifts from fourteen other botanists, namely E. Berry, E. Clough, S. Gibson, W. Hobson, J. Nowell, F. Pill, T. Rogers, D. Schofield, J. Whitehead, W. Wilson and four indicated only by the initials A.F., A.W., J.B.W. and N.W. Only five specimens bear the characteristically minute handwriting of W. Wilson (Fig 1) and this has been verified by comparison with authenticated writing among Wilson's papers at the British Museum (Natural

History). Two letters among the correspondence of E. Hobson at Manchester Museum identify the writing on a further eight specimens as that of J. Tinker (Fig 2), yet Hill (1907) implied that most of the specimens in the herbarium, as they existed at the beginning of the twentieth century, had been labelled by Tinker. There is also a single gathering of *Sphagnum cuspidatum* Ehrh. from Ashton Moss which, although confirmation has not been obtained, may have been annotated by its collector, W. Hobson (Fig 3), but the other 109 specimens bear examples of only one person's handwriting (Fig 4). It is that of someone whose incidental notes are initialled W.W. (Fig 5), a fact which may have misled Dennis (1981) into supposing that the writing could be that of W. Wilson. Alternatively, while proof is wanting, there is very strong evidence to suggest that the majority of Tinker's specimens still extant were labelled by W. Whitehead.

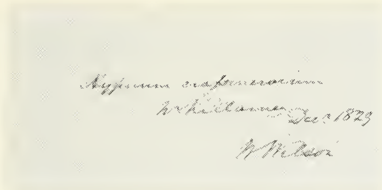
It is evident from herbarium sheets which belonged to the Astley Cheetham Public Library, Stalybridge, and which are now in the Tameside Museum, that W. Whitehead was collecting flowering plants in the vicinity of Stalybridge prior to the First World War. His writing, as suggested by these sheets (Fig 6), is obviously identical to that on many of Tinker's specimens. Less obvious is his reason for labelling them. However, it is known that by 1915, at the latest, Tinker's collections were the worse for neglect or misuse (Bradshaw, 1945). It might be suggested, therefore, that W. Whitehead carried out an essential salvage operation, remounting what specimens he could and transcribing labels as necessary. It is perhaps significant that only Whitehead has written directly on the postcards. All other handwriting is on paper attached to the cards.

If this is indeed what happened, it might dispel, at least as far as the mosses are concerned, some of the widely held suspicions (J. Cassidy and F. W. Roberts, pers. comm.) that all except a few remnants of Tinker's collections were distributed among private collectors on the closure of the museum in Stamford Park, where they were originally housed under the joint ownership of Ashton-under-Lyne and Stalybridge Borough Councils. Many may have been lost by neglect long before this, and perhaps even within a shorter period than ten years if Hill's (1907) report of the herbarium's value at that time were based on personal observation rather than repute. The irony would be that, after Tinker had been at pains to protect his moss collection from the ravages of damp in his home by constructing a free-standing cabinet (letter of 1825, Manchester Museum), our public curators should have allowed the herbarium to deteriorate so drastically.

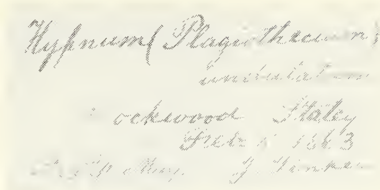
In 1976, I updated the nomenclature and checked the identity of all 124 specimens as far as the material would allow. To avoid defacing them, a separate list of my findings was supplied to Tameside Museum Service where it would appear that the names provided were written on the cards themselves. Indeed, it seems that a troublesome ball-point pen has been coaxed into activity on the fronts of three cards and used to underline the name on another, and six cards have been numbered on the face. Most of the specimens have recently been properly incorporated in the Museum's collections in two series and now bear accession numbers 1978/4204 to 1978/4323 and 1978/7723 to 1978/7725. One, a specimen of *Hygrophypnum ochraceum* (Turn. ex Wils.) Loeske, leg, J. Nowell, without accession number, is missing. The only other alteration since W. Whitehead labelled them is that the attachment of covering tissue paper has been reinforced by transparent self-adhesive tape, an unfortunate but well-intentioned choice of material. Nevertheless, whatever their form, the survival of these specimens does provide a valuable insight into local environmental changes over the last 150 years. Pronounced though these changes have been, their effects have been considerably less devastating than a previous report would imply (Branson, 1967).

Tinker's own gatherings were made between 1821 and 1864, chiefly within a few miles of Stalybridge, Mottram in Longdendale, Greenfield and Ashton-under-Lyne, though some from as far afield as Buxton, Southport, Rostherne, Llanberis and Warwickshire. Among the earlier ones may be mentioned *Splachnum sphaericum* Hedw. from Ashton Moss, an area which retained the character of a shaking bog well into the nineteenth century (Aikin, 1795; Butterworth, 1823). Drained between 1831 and 1868 (Bowman, 1960), its height continued to drop conspicuously until earlier this century. It now supports a mere fraction of once flourishing horticultural activities and is as unlikely as any of the other mosses in Greater Manchester to possess a member of the Splachnaceae. Also of interest are *Racomitrium lanuginosum* (Hedw.) Brid. and *Thamnobryum alopecurum* (Hedw.) Nieuwl., which appear to have been sensitive to

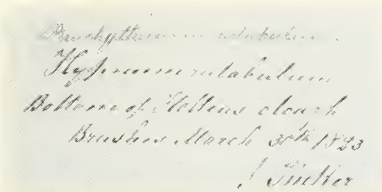
1



4



2



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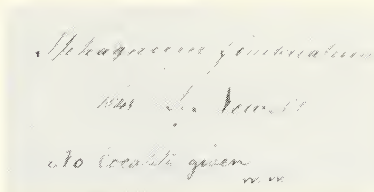
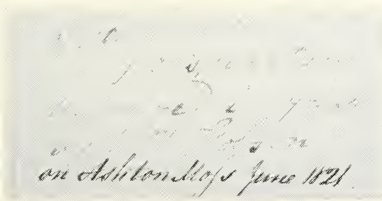
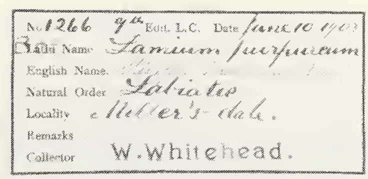


3



6



FIGURES 1–6
Label facsimiles from Jethro Tinker herbarium. (1) William Wilson scripsit; (2) Jethro Tinker scripsit, first line added by W. Whitehead; (3) unidentified hand, possibly William Hobson's, last line added by Jethro Tinker. (Reproduction *c.* × 0.6.)
Label facsimiles from (4–5) Jethro Tinker herbarium and (6) W. Whitehead herbarium. (4) W. Whitehead scripsit; (5) Jethro Tinker scripsit, annotated by W. Whitehead; (6) W. Whitehead scripsit. (Reproduction *c.* × 0.6.)

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pollution concomitant with industrialization and a population increase from c. 500 in the eighteenth century to c. 5000 in 1823 (Butterworth, 1823), 17,000 in 1836 and more than 20,000 in 1841 (Hill, 1907) in Stalybridge alone. The former species has been present in the district for at least the last thirty years and doubtless longer. It is now increasing in frequency but is still much less abundant than Tinker implied was the case around Greenfield in 1821. *T. alopecurum*, however, is rare. It has certainly not been seen in recent years in Early Banks Wood, Stalybridge, where Tinker found it, and this is an area which has changed mainly in the level of water-borne pollution. The disappearance of *Climacium dendroides* (Hedw.) Web. and Mohr from Carrhouse near Mottram in Longdendale, on the other hand, points to improved drainage of agricultural land. *Mnium marginatum* (With.) P. Beauv. probably no longer grows at Seals-bark, Greenfield, where the Yorkshire Naturalists' Union for example did not find it (Branson, 1967), nor does *Rhytidiadelphus loreus* (Hedw.) Warnst. at the Brushes, Stalybridge, yet most of the other local species represented in Tinker's remaining herbarium are still typical of the exact localities from which they were collected well over a century ago. *Buxbaumia aphylla* Hedw., from Hollingworth Bank Wood, leg. A.W., 1866, however, is a notable exception both for its rarity locally and in Britain as a whole (Warburg, 1963). The gift of a sample to the seventy-eight-year-old naturalist can therefore be taken as a clear indication of the respect with which its finders (Whitehead, 1888) regarded Jethro Tinker.

In the list of specimens which follows, localities have been identified with vice-counties wherever possible. The few specimens inadequate for confirmation of original names are indicated by asterisks, and specimens bracketed together are attached to a single postcard.

SPHAGNACEAE

Sphagnum capillifolium (Ehrh.) Hedw. Nant Cramnant, Near Trefriw (49), 1863.
S. fimbriatum Wils. without locality, leg. J. Nowell, 1848.
{*S. plumulosum* Röll cfr. Ashton Moss (59), leg. Wm. Hobson, 1821.
{*S. cuspidatum* Ehrh. Ashton Moss (59), leg. Wm. Hobson, 1821.
S. plumulosum Röll cfr. Greenfield (63), leg. J. Tinker.
S. squarrosum Pers. ex Crome cfr. Pittsteads, Dukinfield (58), leg. J.T., 1821.
S. auriculatum Schimp. Stansfield Moor (—), leg. J. Nowell, 1853.
S. tenellum Pers. without locality, leg. J. Nowell, 1848.

POLYTRICHACEAE

Polytrichum alpinum Hedw. cfr. not localized (58), leg. D. Schofield, 1867.
P. commune Hedw. cfr.
P. commune Hedw. cfr. without locality, leg. J. Tinker, 1821.
P. commune Hedw. cfr. Charlesworth Coombes (57), leg. J. Tinker, 1855.
P. juniperinum Hedw. cfr. Stansfield Moor (—), 1848.

BUXBAUMIACEAE

Buxbaumia aphylla Hedw. cfr. Hollingworth (58), leg. A.W., 1866.

SELIGERIACEAE

Blindia acuta (Hedw.) B., S. and G. cfr. Snowdon (49), 1852.

DICRANACEAE

Oncophorus virens (Hedw.) Brid. cfr.
Dichodontium pellucidum (Hedw.) Schimp. cfr. Early Banks Wood, Stalybridge (58), leg. J. Tinker, 1828.
{*Dicranella crispa* (Hedw.) Schimp. cfr. Pilkington (59), leg. J.B.W., 1844.
{*D. crispa* (Hedw.) Schimp. cfr. Alderley Edge (58), 1862.
D. heteromalla (Hedw.) Schimp. cfr. Brushes, Stalybridge (58), leg. J. Tinker, 1845.
D. palustris (Dicks.) Crundw. ex E. F. Warb. cfr. Stalybridge (58), leg. J. Tinker, 1861.
{*D. schreberana* (Hedw.) Dix. cfr. Near Warrington (59), leg. W. Wilson, 1854.
{*D. schreberana* (Hedw.) Dix. Stirrup Wood (58), 1860.
D. subulata (Hedw.) Schimp. Alderley Edge (58), 1863.
D. varia (Hedw.) Schimp. cfr. Hurstheads, Hattersley (58), leg. J. Tinker, 1863.
Dicranum falcatum Hedw. cfr. Ben Nevis (97).
D. scoparium Hedw. cfr. High Green Wood, Near Heptonstall (63), 1848.
D. scoparium Hedw. cfr. Brushes, Stalybridge (58), leg. J. Tinker, 1830.
D. scottianum Turn. cfr. Ireland, leg. W. Wilson, 1829.
D. spurium Hedw. without locality, specimen and label probably mixed.
D. undulatum Brid. Wybunbury Bog (58), leg. J.N., 1856.
Campylopus atrovirens De Not. Snowdon (49), 1853.
C. brevipilus B., S. and G. Shipworth Moor, Near Selby (—), leg. J. Nowell, 1858.
C. paradoxus Wils. in Hardy cfr. Highgreen Wood, Near Heptonstall (63), 1849.
C. pyriformis (Schultz) Brid. cfr. Knots Wood, Stansfield (—), 1849.

GRIMMIACEAE

Racomitrium aciculare (Hedw.) Brid. cfr. without locality, leg. J. Tinker, 1824.
R. affine (Web. and Mohr.) Lindb. cfr. Snowdon (49), leg. J.N., 1855.
R. aquaticum (Brid.) Brid. Near Llanberis (49), leg. Tinker, 1852.
R. canescens var. *ericoides* (Hedw.) Hampe cfr. without locality.
R. ellipticum (Turn.) B. and S. cfr. Snowdon (49), leg. J.N., 1855.
R. fasciculare (Hedw.) Brid. cfr. Brushes, Stalybridge (58), leg. J. Tinker, 1821.
R. lanuginosum (Hedw.) Brid. cfr. Greenfield (63), leg. J. Tinker, 1821.

DISCELIACEAE

Discelium nudum (Dicks.) Brid. cfr. Rams Clough, Saddleworth (63), leg. J. Tinker, 1862.

FUNARIACEAE

Physcomitrium pyriforme (Hedw.) Brid. cfr. Early Banks, Stalybridge (58), leg. Jethro Tinker, 1853.

SPLACHNACEAE

{*Splachnum ampullaceum* Hedw. cfr. without locality, 1863.
{*Tetraplodon mnioides* (Hedw.) B. and S. cfr.
S. sphaericum Hedw. cfr. Ashton Moss (59), leg. J. Tinker, 1821.
S. vasculosum Hedw. Ben Lawers (88), leg. W. Wilson, 1836.

MNIACEAE

Mnium hornum Hedw. cfr. Early Banks Wood, Stalybridge (58), leg. J. Tinker, 1863.
{*M. marginatum* (With.) P. Beauv. cfr. Seals-bark, Greenfield (63), leg. J. Tinker, 1832.
{*Plagiomnium rostratum* (Schrad.) Kop. cfr.
M. thomsonii Schimp. not localized, leg. J. Nowell, 1857.
Rhizomnium pseudopunctatum (Br. Eur.) Kop. cfr. Rams Clough, Saddleworth (63), leg. J. Tinker, 1853.
R. punctatum (Hedw.) Kop. cfr. Early Banks Wood, Stalybridge (58), leg. J. Tinker, 1822.
Plagiomnium rostratum (Schrad.) Kop. cfr. Ashwood, Buxton (57), leg. J. Tinker, 1851.
P. undulatum (Hedw.) Kop. cfr. Ashwood, Nr Buxton (57), leg. J. Tinker, 1851.

BARTRAMIACEAE

Plagiopus oederi (Brid.) Limpr. cfr. Ashwood (57), leg. D. Schofield and J. Tinker, 1851.
P. oederi (Brid.) Limpr. cfr. Ashwood, Buxton (57), leg. J. Tinker, 1845.
P. oederi (Brid.) Limpr. cfr. Ashwood Dale (57), leg. D. Schofield and J. Tinker, 1851.
Bartramia hallerana Hedw. cfr. without locality.
B. ithyphylla Brid. cfr. Gorpley Clough (—), 1847.
B. pomiformis Hedw. cfr. Hollins Clough, Stalybridge (58/59), 1822.
Philorotis calcarea (B. and S.) Schimp. cfr. Brushes, Stalybridge (58), leg. J. Tinker, 1846.
P. fontana (Hedw.) Brid. cfr. Near Whitfield, Glossop (57), leg. J. Tinker, 1845.
P. rigida Brid. Near Tremadoc (49), leg. W. Wilson, 1863.
Breutelia chrysocoma (Hedw.) Lindb. cfr. without locality, leg. S. Gibson.

CLIMACIACEAE

Climacium dendroides (Hedw.) Web. and Mohr cfr. Carrhouse, Nr Mottram (58), leg. J. Tinker, 1825.

NECKERACEAE

Neckera crispa Hedw. cfr. Todmorden (59/63), leg. J. Nowell.

THAMNIACEAE

Thamnobryum alopecurum (Hedw.) Nieuwl. Early Banks Wood, Stalybridge (58), leg. J. Tinker, 1821.

THELIACEAE

Myurella julacea (Schwaegr.) B., S. and G. South Ireland.

LESKEACEAE

Pseudoleskeella catenulata (Brid.) Kindb. Ingleborough (64), leg. J.N., 1857.
Leskea polycarpa Hedw. Not localized, leg. J. Tinker.

THUIDIACEAE

Heterocladium heteropterum (Bruch ex Schwaegr.) B., S. and G. Powersfall Waterfall (—), leg. W.W.

Thuidium tamariscinum (Hedw.) B., S. and G. Marple (58), leg. N.W., 1866.

Helodium blandowii (Web. and Mohr) Warnst. Knutsford (58), leg. W.W., 1851.

AMBLYSTEGIACEAE

Cratoneuron commutatum (Hedw.) Roth cfr. Limehurst Spring, Ashton-under-Lyne (59), leg. J. Tinker, 1821.

C. commutatum var. *falcatum* (Brid.) Mönk. cfr. Southport (59), leg. E. Clough, 1863.

Campylium elodes (Lindb.) Kindb. Southport (59), leg. E. Clough, 1863.

C. polygamum (B., S. and G.) J. Lange and C. Jens. cfr. Southport (59), leg. J. Tinker, 1861.

C. stellatum (Hedw.) J. Lange and C. Jens. Marple (58), leg, J. Tinker, 1845.

Amblystegium riparium (Hedw.) Br. Eur. cfr. Near Stalybridge (58), leg. J. Tinker, 1821.

A. varium (Hedw.) Lindb. cfr. Near Liverpool (59).

Drepanocladus exannulatus var. *exannulatus* (B., S. and G.) Warnst. cfr. Swineshaw, Stalybridge (58/59), leg. E. Clough, 1863.

D. fluitans var. *fluitans* (Hedw.) Warnst. cfr. Todmorden (59/63), leg. John Nowell, 1848.

D. fluitans var. *fluitans* (Hedw.) Warnst. Swineshaw, Stalybridge (58/59), leg. J. Tinker, 1852.

D. lycopodioides (Brid.) Warnst. Southport (59), leg. E. Clough, 1863.

D. revolvens (Turn.) Warnst. cfr. Swineshaw, Stalybridge (58/59), leg. J.W., 1864.

**D. sendtneri* (Schimp.) Warnst. Southport (59).

Hygrohypnum luridum (Hedw.) Jenn. cfr. Ashwood Dale (57), leg. J. Tinker, 1850.

H. ochraceum (Turn. ex Wils.) Loeske Near Todmorden (59/63), leg. J. Nowell.

Scorpidium scorpioides (Hedw.) Limpr. cfr. Malham Moor (64), 1849.

Calliergon cordifolium (Hedw.) Kindb. cfr. Stalybridge (58), leg. J. Tinker, 1840.

C. cuspidatum (Hedw.) Kindb. cfr. without locality, leg. J. Tinker, 1823.

C. giganteum (Schimp.) Kindb. Hale Moss (58), leg. J. Whitehead, 1863.

C. sarmentosum (Wahlenb.) Kindb. Snowdon (49), 1857.

C. stramineum (Brid.) Kindb. Swineshaw, Stalybridge (58/59), leg. J. Tinker, 1822.

BRACHYTHECIACEAE

Scorpiurium circinatum (Brid.) Fleisch. and Loeske Near Beaumaris (52), leg. T. Rogers, 1863.

Homalothecium lutescens (Hedw.) Robins. cfr. Helks Woods (64), 1850.

H. nitens (Hedw.) Robins. Wybunbury Bog (58), 1855.

{ *H. sericeum* (Hedw.) Br. Eur. cfr. Early Bank Wood, Stalybridge (58), leg. J. Tinker, 1822.
{ *H. sericeum* (Hedw.) Br. Eur. Kettlewell (64), leg. E. Berry.

Brachythecium albicans (Hedw.) B., S. and G. Southport (59), leg. J. Tinker, 1861.

B. albicans (Hedw.) B., S. and G. Southport (59), leg. J. Tinker, 1861.

B. plumosum (Hedw.) B., S. and G. cfr. Lyne Edge, Dukinfield (58), leg. J. Tinker, 1821.

B. plumosum (Hedw.) B., S. & G. cfr. Early Banks Wood, Stalybridge (58), leg. J. Tinker, 1853

B. rutabulum (Hedw.) B., S. and G. cfr. Brushes, Stalybridge (58), leg. J. Tinker, 1823.

B. velutinum (Hedw.) B., S. and G. cfr. Early Banks Wood Stalybridge (58), leg. J. Tinker, 1853.

B. velutinum (Hedw.) B., S. and G. cfr. Near Todmorden (59/63), 1850.

Scleropodium tourretii (Brid.) L. F. Koch cfr. Orme's Head, Llandudno (49), leg. F. Pill.

Cirriphyllum crassinervium (Tayl.) Loeske and Fleisch. cfr. Near Killarney (H1/2), leg. W. Wilson, 1829.

C. piliferum (Hedw.) Grout cfr. Dan Bank Wood, Marple (58), 1863.

Rhynchostegium confertum (Dicks.) Br. Eur. cfr. Marple (58), leg. A.F., 1864.

R. riparioides (Hedw.) C. Jens. cfr. Nr Stalybridge (—), leg. J. Tinker, 1864.

Eurhynchium praelongum (Hedw.) Br. Eur. cfr. Early Banks Wood, Stalybridge (58), leg. J. Tinker, 1822.

E. striatum (Hedw.) Schimp. Flaxfield, Stalybridge (58), leg. J. Tinker, 1823.

E. swartzii (Turn.) Curn. in Rabenh. cfr. Newlyn Cliff, Penzance (1), 1861.

Rhynchostegiella teesdalei (Br. Eur.) Limpr. Chee Tor (57), leg. J.N., 1851.

PLAGIOTHECIACEAE

**Plagiothecium denticulatum* (Hedw.) B., S. and G. cfr. without locality, leg. J. Tinker, 1851.
P. undulatum (Hedw.) B., S. and G. Cockwood, Stalybridge (58), leg. J. Tinker, 1863.
**Herzogiella seligeri* (Brid.) Iwats. cfr. Helks Wood, Ingleton (64), leg. W. Wilson, 1861.
Isopterygium elegans (Hook.) Lindb. Alderley Edge (58), leg. J. Whitehead, 1860.
Taxiphyllum wissgrillii (Garov.) Wÿk and Marg. Hareleywood (—), 1848.

SEMATOPHYLLACEAE

Sematophyllum demissum (Wils.) Mitt. cfr. Near Killarney (H1/2), leg. W. Wilson, 1829.

HYPNACEAE

**Pylaisia polyantha* (Hedw.) B., S. and G. cfr. Thorns Broughton Hall (—), 1850.
Hypnum lindbergii Mitt. Near Burnley (59), 1853.
Hyocomium flagellare B., S. and G. cfr. Swineshaw, Stalybridge (58/59), leg. J. Whitehead, 1861.
Rhytidiadelphus loreus (Hedw.) Warnst. cfr. Brushes, Stalybridge (58), leg. J. Tinker, 1822.
R. triquetrus (Hedw.) Warnst. Woolscott Great Piece (38), leg. J. Tinker, 1849.
Hylocomium brevirostre (Brid.) B., S. and G. cfr. Helk's Wood, Near Ingleton (64), 1850.
H. splendens (Hedw.) B., S. and G. cfr. Ashwood Dale (57), leg. J. Tinker, 1845.

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YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 1980

Compiled by
A. HENDERSON and M. R. D. SEAWARD

Painsthorpe and Uncleby (V.C. 61) (21st June)
Painsthorpe and Uncleby lie close together on the western escarpment of the Wolds, just north of the York to Driffield road, an area comprising two very steep-sided valleys headed by the Brows. Uncleby Brow was scheduled as a Site of Special Scientific Interest because of the relationship of vegetation cover to extreme steepness.

Members met at the top of Garrowby Hill during a mixture of sunny spells and heavy clouds with a fresh south-westerly blowing and, after some heavy rain, moved off to South Wold Dale, Scottendale and Painsthorpe Dale and a variety of habitats.

Ornithology (B. S. Pashby)
An extremely noisy Curlew announced the presence of at least one bird at the head of Painsthorpe Dale, the Lapwing being the only other wader seen. Three species, typical of the partly-wooded Wolds valleys were the Redstart (two pairs and young seen), the Tree Pipit (heard in many areas) ad the Mistle Thrush (a party of fledged young flying around). Of the warblers, the Blackcap, Whitethroat and Willow Warbler were noted. A Tawny Owl was the only bird of prey sighted. Of game birds, the Red-legged Partridge merits a mention. Forty species were seen, a good total for this part of the County. I am grateful for Mr Upton's help in preparing this report.

Mammals and other Vertebrates (E. H. Wear)
As records for this area are extremely scarce, the following provided a useful addition to the Mammal Atlas of East Yorkshire: three Hares, Mole, Water Vole, ten to fifteen Rabbits, a live Pygmy Shrew, a dead Common Shrew, a Stoat with young, three decomposed Brown Rats on a gibbet, a Grey Squirrel, a Hedgehog and a Ferret. It was noticeable that there were no signs of Fox or Badger. The only amphibians reported were three Frogs.

Mollusca (L. Lloyd-Evans)
The Yorkshire Wolds are rich in mollusca and a representative selection of species was found. The river limpet *Ancylus fluviatilis* was common in the unpolluted chalk streams. *Cochlodina laminata* is locally distributed in Yorkshire preferring old deciduous woodland on base-rich soils; it was interesting to find it on an isolated dead tree trunk in a marshy field at Painsthorpe several hundred metres from the nearest wood.

Entomology (W. A. Ely)
The morning was spent in the valley to the south of Painsthorpe, where the fields bordering the stream held insects typical of this habitat. In the afternoon the valley north of the village, east of Admiral Plantation was investigated. The first insect of the afternoon was also the best, the hoverfly *Criorhina floccosa* which resembles the carder bees and is uncommon in the north. The marshes in the valley bottom were then explored. The click beetle *Denticollis linearis* and the rove beetle *Philonthus sanguinolentus* were found here, Mr Marsh collected the rove beetle *Creophilus maxillosus* while Mr Richardson and Mr Kendall collected the beetle *Dascillus cervinus* and the rhinoceros beetle *(Sinodendron cylindricum)* – the latter under water!

Lepidoptera (J. Payne)
A morning shower, a cool wind and little sun are unpromising conditions for recording butterflies and moths. The Small White, Green-veined White, Orange Tip (in egg, larval and imago stages), Small Copper, Common Blue, Large Skipper, and Small Heath were the butterflies seen.

Among the moths the Chimney Sweeper was plentiful in the meadows and the Silver-Ground Carpet was frequent. A small geometrid, the Angle-barred Pug *Eupithecia innotata*

Hufn. proved the best capture of the day. The large and striking caterpillar of the Figure of Eight was the only noctuid noted.

Arachnology (C. J. Smith)

Weather conditions (showers and wind), terrain (dry valleys) and farm management (close cropped turf) limited the quantity and variety of species recorded.

The following species were noted in Painsthorpe dry valley: *Pardosa pullata* ♀ ♂, *Pachygnatha clercki* ♀, *Entelecara acuminata* ♀, *Gonatium rubens* ♀, *Pocadicnemis pumila* ♀ ♂, *Oedothorax retusus* ♂, *Monocephalus fuscipes* ♀, *Araeoncus humilis* ♀, *Diplostyla concolor* ♂, *Stemonyphantes lineatus*♀, *Lepthyphantes obscurus* ♀, *L. zimmermanni* ♀ ♂, *L. mengei* ♀, *L. flavipes* ♂, *L. pallidus* ♀ ♂, *Linyphia clathrata* ♀.

On the roadside and in the dry valley at Uncleby were: *Clubiona lutescens* ♀, *Theridion bimaculatum* ♂, *Enoplognatha ovata* ♀ ♂, *Tetragnatha extensa* ♀, *Pachygnatha clercki* ♀, *Meta mengei* ♂, *M. merianae* ♀, *Araneus cucurbitinus* ♂, *Gongylidium rufipes* ♀, *Dismodicus bifrons* ♀ ♂, *Maso sundevalli* ♀, *Pocadicnemis pumila* ♀, *Erigone atra* ♂, *Linyphia clathrata* ♀.

No species calls for special comment, but many are new records for the 10 km. square SE/85, which has had very little attention from arachnologists in the past.

Other Arthropods (D. T. Richardson)

As there were no records for centipedes or millipedes from 10 km square 44/85 and a negligible number for V.C. 61 as a whole the meeting provided an opportunity to rectify the situation. Both areas were visited and the species listed were common to both. New records for the square are indicated by an asterisk.

Woodlice — *Armadillidium vulgare*,* *Oniscus asellus*, *Philoscia muscorum*, *Porcellio scaber*, *Trichoniscus pusillus*. Centipedes – *Lithobius crassipes*,* *L. forficatus*,* *L. melanops*,* *L. macilentus** (beneath logs and stones). Millipedes – *Brachydesmus superus*,* and *Brachyiulus pusillis** (large numbers in the soil and in sheep dung); *Cylindroiulus punctatus** and *Proteroiulus fuscus** beneath bark; *Polydesmus angustus*,* *Glomeris marginata** and *Tachypodoiulus niger** (beneath stone and logs). Harvestmen — *Nemastoma bimaculatum** (under stones and logs).

None of the species are particularly uncommon but the presence of large numbers of the millipedes *B. superus* and *B. pusillis* is interesting for there are comparatively few records for either species, which may be due to their being small true soil animals living relatively deep down.

Examination of the stream (44/821587) in the fields below Admiral Plantation provided specimens of the freshwater triclad *Crenobia alpina** and the freshwater shrimp *Gammarus pulex*.* The water had a pH of 7.90 and contained 182 mg calcium carbonate per litre.

Flowering Plants (E. Crackles)

One party of botanists worked along the road from Painsthorpe towards Kirkby Underdale. The most notable species here were *Carex spicata* (Spiked Sedge) in a ditch and the hybrid grass *Festuca pratensis* x *Lolium perenne* on the verge.

Hordeum secalinum (Meadow Barley) occurred in some quantity in the pasture traversed by Kirby Beck whilst species noted in the marshy areas by the stream included: *Veronica beccabunga* (Brooklime), *Stellaria alsine* (Bog Stitchwort), *Juncus acutiflorus* (Sharp-flowered Rush), *J. inflexus* (Hard Rush), *J. effusus* var. *compactus* (Soft Rush) and *Carex hirta* (Hairy Sedge).

Other parties reported *Equisetum telmateia* (Great Horsetail), *Lychnis floscuculi* (Ragged Robin) and *Iris pseudacorus* (Yellow Iris) in quantity higher up the beck, with *Caltha palustris* (Marsh Marigold), *Lotus uliginosus* (Marsh Bird's-foot Trefoil), *Pulicaria dysenterica* (Common Fleabane) and *Carex ovalis* (Oval Sedge) also present. One bush of *Thelycrania sanguinea* (Dogwood) was noted.

In the meadow between Scottendale Farm and Admiral Plantation, *Carduus nutans* (Nodding Thistle) was frequent with a few plants of the hybrid with Welted Thistle, *Carduus*

acanthoides x *C. nutans*. *Crepis paludosa* (Marsh Hawk's-beard) was locally frequent in the damp areas of the wood and there was a very fine show of *Conopodium majus* (Earthnut) along the wood edge.

By the spring-fed Uncleby Beck, the marshy ground near the north-eastern corner of the plantation was of particular interest. Species noted included: *Triglochin palustris* (Marsh Arrow-grass), *Myosotis discolor* (Yellow and Blue Forget-me-not), *Mentha aquatica* (Water Mint), *Valeriana dioica* (Marsh Valerian), *Blysmus compressus* (Flat Sedge) in some quantity, *Carex echinata* (Star Sedge) and *C. spicata* (Spiked Sedge).

The most notable species on the steep valley slopes of Southwold and Uncleby were: *Helianthemum chamaecistus* (Common Rockrose), *Arenaria serpyllifolia* (Thyme-leaved Sandwort), *Linum catharticum* (Purging Flax), *Onosis repens* (Restharrow), *Poterium sanguisorba* (Salad Burnet), and *Betonica officinalis* (Betony).

Plant Galls (L. Lloyd-Evans)

The following plant galls were noted: *Dasyneura ulmariae* on *Filipendula ulmaria*, *D. urticae* on *Urtica dioica*, *Diplolepis rosae* on *Rosa canina*, *Eriophyes goniothorax typicus* on *Alnus glutinosa*, *E. similis* on *Prunus spinosa*, *E. squalidus* on *Scabiosa columbaria*, *Eriosoma ulmi* on *Ulmus glabra*, *Jaapiella veronicae* on *Veronica chamaedrys*, *Rhabdophaga rosaria* on *Salix alba*.

Bryology (T. L. Blockeel)

Bryologically, the dry chalk banks were rather unproductive. Species found included *Homalothecium lutescens*, *Rhytidiadelphus triquetrus* and *Weissia microstoma*. Elders by a plantation had quantities of *Zygodon viridissimus* var. *viridissimus* and a little *Orthotrichum diaphanum*. *Seligeria paucifolia* was on a stone in the pasture nearby. Other speices from dry habiats included *Barbula hornschuchiana* and *Cirriphyllum piliferum*.

Wet areas around springs added much-needed variety to the flora. *Climacium dendroides* was found near Admiral Plantation, and *Dicranella schreberana*, *Physcomitrium pyriforme* and *Pottia starkeana* ssp. *minutula* (first confirmed record for V.C. 61) south of Painsthorpe. In Admiral Plantation *Lepidozia reptans* was a little surprising, being a calcifuge species rare in V.C. 61 and one of the few hepatics seen during the day. Forty-nine species were seen in all.

Scugdale and Snotterdale (V.C. 62) (14th June) (C. Pellant)

Scugdale and its tributary valley, Snotterdale, are cut into the west-facing escarpment of the Cleveland Hills to the south-east of the village of Swainby. Habitats include deciduous and coniferous woodland, marshland, old mine workings, open moorland, a narrow gorge with a waterfall, and farmland. Permission to visit the area was kindly granted by Lord Ingleby, whose gamekeeper met us and gave helpful advice on routes.

Thirty members, including representatives of thirteen societies, met outside the Queen Catherine Hotel in Osmotherly. During the short drive from here to the field area the mist changed to heavy rain which continued throughout the day. The dreadful weather conditions hampered observing and collecting, and members were glad to find a warm fire at the Queen Catherine Hotel when they returned there for the tea and meeting.

Dr L. Lloyd-Evans chaired the meeting at which reports were presented, and Mr Ian Lawrence proposed a vote of thanks to the Divisional Secretary for organizing the meeting.

Ornithology (G. E. Alderson)

Owing to heavy rain most of the day, only twenty-six species were seen or hard.

The Cuckoo was calling and seen flying with the usual Pipits in attendance. No raptores were seen, but two Tawny Owls were in a stand of older trees. Occasional agitated Curlews signified young. Several Pheasants were seen and two dead Grouse lay on a path. The complete list for this atrocious day was Pheasant, Woodpigeon, Feral Pigeon, Red Grouse, Cuckoo, Carrion Crow, Snipe, Ring Ouzel, Blackbird, Song Thrush, Curlew, Lapwing, Tawny Owl, Starling, Swallow, Pied Wagtail, Robin, Meadow Pipit, Tree Pipit, Yellowhammer, Chaffinch, Whinchat, Redpoll, Willow Warbler, Coal Tit, and Wren.

Lepidoptera (Mrs J. Payne)
Conditions could hardly have been worse The only butterfly recorded was *Aglais urticae*. The larvae were found on a stand of nettles.

The following Geometrids were seen in small numbers: *Xanthorhoe montanata*, *Lithina chlorosata* and *Eupithecia vulgata.* A single specimen of the Small Argent and Sable, *Epirrhoe tristata*, was taken. The foliage of Hazel and Willow was fragmented, but the *Erranis* sp. usually responsible has already left the trees.

Some larvae collected from Oak were identified as the Hebrew Character, *Othosia gothica. Prunus padus* was well eaten by the larvae of the Figure of Eight moth, *Episena caeruleocephela.* The only imago Noctuid taken was *Apamea crenata.*

Prunus padus also bore the webs of one of the micro Ermine moths, *Yponymeuta* sp.

Coleoptera (M. Denton)
The following beetles were collected: *Sinodendron cylindricum*, *Nebria brevicollis*, *Patrobus excavatus*, *Pterostichus madidas*, *P. niger*, *Anchomenus assimilis*, *A. ruficornis*, *Rhagonycha lignosa*, *Denticollis lincaris*, and *Athous haemorrhoidalis.*

Vascular Plants (T. F. Medd)
Incesant rain made serious recording almost impossible but nevertheless fourteen new records for the Atlas were added. An untreated field near the roadside proved to be quite marshy and here we found *Myosotis discolor*, *Alopercurus geniculatus*, *Equisetum palustre*, *Carex remota*, and *Crepis paludosa.*

Despite worsening weather many members made their way up the hill to the open moorland recording *Trientalis europaea*, *Drosera rotundifolia*, *Equisetum sylvaticum*, *Hypericum pulchrum* and *Carex caryophyllea.*

The remaining species new to square 45(NZ)/50 were *Epilobium parviflorum*, *Carex sylvaticum* and *C. panicea: Equisetum telmateia* was growing by the roadside near the car park along with a good stand of what proved to be no more than a very luxuriant form of *E. arvense.*

Bryology (T. L. Blockeel)
Only 43 bryophytes were recorded in the attractive Snotterdale valley, and although more species would have been found in better conditions, the area was fairly well searched and may not hold any real surprises. *Tetradontium brownianum* was notably abundant on dark sandstone rocks at the waterfall towards the head of the valley. Other species occurring by the stream and on wet rocks were *Marsupella emarginata, Nardia compressa* and *Solenostoma sphaerocarpum. Barbilophozia attenuata* was on dry rocks, and *Calliergon stramineum* and *Sphagnum squarrosum* were among the mosses from wet flushes. The best find was a small amount of immature *Tetraplodon mnioides* on a sheep skull, apparently the first record in V.C. 62 since 1911. It is an elusive moss confined to animal remains in moorland areas.

Rockley (V.C. 63) (17th and 18th May)
The meeting took place towards the end of the hot, dry spell which we enjoyed during the first half of May. The area visited on Saturday stretched from Worsbrough Reservoir westwards to the M1, most of it within the Worsbrough Country Park. The party walked along the southern edge of the reservoir, through the Carr where the Rockley Dyke flows in, then followed the Dyke through a marshy area where new ponds have recently been excavated and on to a pond and marsh below Rockley Old Hall. The footpath past the Old Hall and northwards brought us to the other inlet to the reservoir, again surrounded by carr, and along the reservoir's western edge to rejoin the path.

Sunday was spent in the Don Frest to the west of the M1. Old Park Woods consisted of an eastern fringe of wet woodland running parallel to the motorway, a felled central area which has recently been replanted with conifers, and a western area of secondary woodland. Broom Royd Wood was separated from it by the Rockley Dyke and meadows, and again consisted of

secondary woodland with a fringe of old trees lining the track on its southern edge. The tea and meeting were held in the interpretation centre at the Country Park.

Our thanks are due to the Country Park Authorities, the Forestry Commission and local landowners for permission to visit the areas under their control, to the Park's ranger, Mr Philip Page, and to Mr Godfrey Blunt for their assistance before and during the meeting.

Ornithology (P. Page and A. G. Blunt)

Fifty-eight species were identified over the weekend, of which the environs of Worsbrough Reservoir produced forty-nine. Water birds were not in any great numbers but included Little and Great Crested Grebes, Heron and drake Shoveler at the reservoir, and Tufted Ducks both there and on the ponds at Rockley Abbey. Most of the common passerines were seen. A small colony of Reed Warblers was present at the reservoir, and Blackcaps were numerous in all the woodlands visited. Redpolls and Tree Pipits were not uncommon in a partially cleared area of Old Park Wood, while Chiffchaff and Garden Warbler were found in the more mature parts of Broom Royd Wood. Both spotted Woodpeckers were seen, the Lesser in the Willow Carr at Worsbrough Reservoir, where it is known to breed, and the Greater in similar habitat in the now drained Rockley Dam. A roving Woodcock was heard over a nearby wood on the Saturday evening. Little direct evidence of breeding was obtained on the two days, except for a brood of Mallard on the reservoir, Pied Wagtails feeding young at Rockley Old Hall, and a Chaffinch's nest with eggs near Rockley Dam.

Mammals and other Vertebrates

The following mammals were seen by different members during the weekend: Rabbit, Grey Squirrel, Fox, and Water Vole. The amphibians, Great Crested Newts, Common Newts, Frog and Toad were in residence, and Grass Snakes were the only reptiles seen.

Entomology (W. A. Ely)

Although this meeting was rather early in the year for most insects, the fine weather brought out the sun-loving hoverflies and bees.

The damp areas bordering the Rockley Dyke between the reservoir and the M1 were explored on the Saturday, and Mr Denton collected the ground beetles *Bembidion dentellum* (Thunb.) (abundant in many places), *Badister sodalis* (Duft.), *Agonum gracile* Sturm and *A. micans* Nic. and the leaf beetle *Prasocuris phellandrii* (L.). The empid fly *Rhamphomyia tibialis* Mg. was found in the marsh near the new ponds and *R. crassirostris* (Fall.) in the marsh below Rockley Old Hall. The rove beetle *Philonthus quisquiliarius* (Gyll.) and the beetle *Heterocerus fenestratus* (Thunb.) were also in this marsh, the latter walking on the mud surface rather than burrowing beneath it and just below the Hall Mr Flint collected the ruby-tail wasp *Chrysis ignita* (L.).

On the Sunday the drier areas west of the M1 again yielded *Bembidion dentellum* and Mr. Garland collected the flea beetle *Phyllotreta tetrastigma* (Com.) on *Cardamine amara* L. and *flexuosa* With. In Old Park Wood, desite the severe impact of forestry, the beetle *Hylecoetus dermestoides* (L.) and the fly *Xylophagus ater* Mg. were found (the former by Mr Denton), both indicative of relatively old woodland. The longhorn beetle *(Clytus arietis* (L.) was here and Mr Denton found the weevil *Magdalis armigera* (Four.), while Mr Garland recorded the craneflies *Tipula maxima* Poda and *Pedicia rivosa* (L.). The oak gall caused by the gall wasp *Andricus lignicola* (Hartig), a recent addition to the Yorkshire fauna, persisted from the previous year, and several swarms of male ichneumons (*Diplazon pectoratorius* Grav.) were under the cover of overhanging branches. A brief visit to Broom Wood added the St Mark's fly *Bibio lanigerus* Mg. and the empid *Hilara galactoptera* Strobl, the latter uncommon in the vice-county.

Lepidoptera (S. P. Garland)

The warm, dry weather favoured the butterflies with a total of nine species being recorded including Dingy Skipper, discovered in an area of felled trees in Old Park Wood. Moths were not numerous and I am grateful to A. G. Blunt for a list of species recorded around Worsbrough that weekend, at night. Interesting species included Broad-barred White, Water Carpet and Herald, with daytime records of Mother Shipton and Small Yellow Underwing from grassland in Old Park Wood. This wood also produced records of the following

species. *Esperia sulphurella* (F.), *Anthophila fabriciana* (L.), *Eulia ministrana* (L.), *Micropteryx calthella* (L.), *Ancyclis myrtillana* (Tr.) and *Epiblema scutulana* (D-S).

Arachnology (Clifford J. Smith)

The following species were recorded during the excursion to Worsbrough on 17th May.

Species	*Col. 1*	*Col. 2*
*Dictyna uncinata**	♂♀	
*Segestria senoculata**	♀	
*Micaria pulicaria**	♀	
Clubiona lutescens		♀
Xysticus cristatus	♂♀	
*Philodromus aureolus**	♀	
Pardosa pullata	♀	
P. amentata	♂♀	♀
*P. lugubris**	♂	
Theridion sisyphium	♂♀	
*Tetragnatha extensa**		♀
*T. montana**		♀
Pachygnatha clercki		♂♀
*Meta mengei**		♂♀
M. merianae		♀
*Araneus cucurbitinus**		♀
*Walckenaera unicornis**	♀	♀
*Gnathonarium dentatum**		♀
*Gongylidium rufipes**		♂♀
Dismodicus bifrons		♂
Hypomma bituberculatum	♂♀	♀♂
Pocadicnemis pumila		♂
Oedothorax gibb/tub		♀
*Oe. gibbosus**		♂
*Oe. tuberosus**		♂
Oe. fuscus		♂
*Savygnya frontata**		♀
*Diplocephalus permixtus**	♀	♀
Erigone atra		♂
*Leptorhoptrum robustum**	♀	
Porrhomma pygmaeum x		♂♀
Centromerita concinna	♀	
Bathyphantes approximatus		♀
B. nigrinus		♂♀
*Kaestneria dorsalis**		♂♀
Diplostyla concolor		♀
*Lepthyphantes mengei**	♂	♂
*Linyphia hortensis**	♀	
L. montana		♀
L. clathrata	♂♀	♂
L. peltata	♂	♂

Column 1 — valley above the reservoir.
Column 2 — area around the reservoir.
*Implies a first record for the SE/30 grid square.

None of this list of species calls for special comment, most of them being common in the type of habitat under consideration. The large number of species new to SE/30 serves to indicate the few records for this area in the past.

Botany (D. R. Grant and Mrs J. E. Duncan)

On Saturday an investigation was made of the flora of the shore of Worsbrough Reservoir and the adjoining wet woodland, marshes and rough grassland.

The most interesting plants around the reservoir were *Stachys palustris*, *Phragmites communis*, *Cardamine amare*, and *Salix viminalis.* There were several good sized colonies of *Polygonum amphibium* in the water together with a little *Potamogeton natans.* In various shady, damp places small colonies of *Ranunculus auricomus*, *Adoxa moschatellina* and *Impatiens noli-tangere* were found. The rough grass fields supported an acid flora typical of the Coal Measures formation. Plants of interest here were *Polygonum bistorta*, *Lathyrus montanus*, *Carex pilulifera*, and *Galium saxatile.*

The marshes near the feeder streams had the following mud-loving Buttercups: *Ranunculus flammula*, *R. sceleratus* and *R. lenormandi.* Here too, the rarest plant of the weekend was discovered, this being *Scirpus sylvaticus.* Three colonies of this plant were found in this area after a thorough search amongst all the wet areas of the reservoir's feeder streams.

A barren old shale heap near the M1 motorway had one area completely covered with the grass *Vulpia bromoides*, an unusual grass for this area.

On Sunday the area around Rockley Abbey was visited. The woods around here have a typical flora of *Milium effusum* L., *Galeobdolon luteum*, *Festuca gigantea*, *Holcus mollis* together with *Endymion non-scriptus*, and *Pteridium aquilinum.* Several of the woods have large colonies of naturalized *Rhododendron ponticum* in them making them unattractive for botanists. It was noticed that the Rhododendrons have now started to colonise the motorway embankments. The most interesting plant of the day was the Adder's Tongue Fern *(Ophioglossum vulgatum)*. During the whole weekend over 160 species were seen in the two Tetrads worked.

The rust *Puccinia adoxae* was found on some specimens of *Adoxa moschatellina.* There is only one previous record for this in V.C. 63, for Worsbrough Bridge in 1949.

Bryology (T. L. Blockeel)

The marsh near Rockley Old Hall was the best site visited during the meeting. The handsome *Physcomitrium pyriforme* is rarely recorded in V.C. 63, but was here in some quantity, accompanied by another local moss, *Calliergon cordifolium.* Other species were *Pseudephemerum nitidum*, just sufficiently developed to be identified, *Pohlia wahlenbergii*, and barren but tuber-bearing material of *Leptobryum pyriforme*, the slender stems looking quite unlike the normal fruiting plants.

Concrete of the dam wall produced *Schistidium apocarpum*, *Orthotrichum diaphanum* and *Hypnum cupressiforme* var. *resupinatum*. On disturbed ground nearby were found two of the small tuber-bearing *Bryums, B. violaceum* and *B. klinggraeffii.*

Woodland areas were very dry and had little of note. *Barbula tophacea* was by the stream in Old Park Wood.

A search was made for the minute moss *Ephemerum serratum*, which is known from pastures by the reservoir, but both the weather and the season were highly unsuitable for it. It normally appears during the autumn and winter.

Beckermonds and Oughtershaw (V.C. 64) (19–20th July) (J. Robertson)

On the Saturday morning, fifty members investigated the steep-sided valley of the Wharfe between Beckermonds and Oughtershaw Hall with its numerous calcareous flushes and limestone terraces. After lunch we climbed in heavy rain to the Helks, high meadows and limestone pavements to the north of Beckermonds Farm. Everyone attended a meeting for tea and reports at Buckden Institute, when the chairman, Mrs J. Duncan, thanked Mr J. Roberts, the retiring Divisional Secretary for the vice-county, for organising the meeting and for his work in the Union.

Sunday was drier. Thirty members, led by Miss H. Lefèvre, explored the terrain on the west bank of Oughtershaw Beck, high acid moorland with some peat bog above, small areas

of Scots Pine and Birch plantation and limestone terraces and water meadows along the beck sides.

Dr Lloyd-Evans chaired the meeting for reports from the sections, when sixteen affiliated societies were represented. Miss J. Robertson proposed a vote of thanks to Miss Lefèvre and to the numerous landowners who had given us access.

Ornithology (D. I. Crawshaw)

The morning walk took in the lower part of Oughtershaw Beck. Despite dull, damp weather a Short-eared Owl was seen, along with a number of Wheatears, including some young birds, and a single Common Sandpiper. The afternoon began with heavy rain. When we visited the limestone pavement and meadows above Beckermonds. Curlew were very evident. Three more Short-eared Owls and Yellow Wagtails were also noted. Near the young plantation Spotted Flycatcher and Yellowhammer were seen and heard. Many juvenile Swallows were hawking over the stream. A very wet Sparrowhawk was spotted on the way back into Buckden.

Sunday produced much better weather and many more birds were seen, Short-eared Owls again and three Black Grouse beside a plantation, two Ring Ouzels on the moor, and in the area of old pines near Nethergill, Redpoll, Willow Warbler and Tree Pipit were heard, and Cuckoo and Kestrel seen. A Grey Heron passed overhead and a Dipper flew down the stream. All three species of Wagtail were in the meadows beside the stream, and the day was nicely rounded off when we saw four Oystercatchers near Buckden. In all, forty-seven species were recorded over the weekend.

Mollusca (L. Lloyd-Evans)

A total of twenty species was recorded of which two were additions to square 34/88 of the molluscan Atlas. The snails typical of limestone cliffs and walls were much in evidence: *Pyramidula rupestris*, *Balea perversa* and *Clausilia dubia*. The most interesting find was a small slug *Deroceras agreste*, closely related to and hard to distinguish from the garden pest *D. reticulatum. D. agreste* is fairly well distributed in Scotland, but in England it has been found only on the northern Pennines and in the Norfolk Broads. Several specimens were found near Oughtershaw, one deep in a gryke on the limestone pavement.

Lepidoptera (Joyce Payne)

The only butterflies seen were a Painted Lady at Beckermonds and a good sized group of Small Tortoiseshell larvae above Oughtershaw.

The Chimney Sweeper and the Sliver-ground Carpet were seen on both days. Chimney Sweepers were flying in the rain over the high pastures above Beckermonds. Other members of the Geometridae noted were the Spinach, *Lygris mellinata* and the Green Carpet, *Colostygia pectinataria*. Birch and Willow trees in the wood above Oughtershaw had been eaten to shreds, but the culprits had left the trees.

The only Noctuid taken was the Flame Shoulder, *Ochropleura plecta.*

A few webs on Bird Cherry were no doubt the work of *Yponomeuta evonymella.*

Arachnida (C. J. Smith)

The second half of July is one of the least productive periods of the year for the arachnologist, and the wet condition of the herbage conspired to provide little of interest. The most unusual species recorded was *Nesticus cellulanus*, a spider that is commoner in hilly districts where it inhabits damp, gloomy habitats. Species recorded were: Oughtershaw SD/8681: *Lepthyphantes tenuis* ♂, *Eriogone atra* ♀ ♂, *Erigonella hiemalis* ♀, *Pocadicnemis pumila* ♀, *Oedothorax retusus* ♀; Beckermonds SD/8780 on limestone pavement: *Meta merianae* ♀, *Nesticus cellulanus* ♀, *Lepthyphantes tenuis* ♀ ♂, *Cryphoeca silvicola* ♀, and on the streamside: *Oedothorax fuscus* ♀ ♂, *Bathyphantes gracilis* ♂.

Flowering Plants (W. A. Sledge)

On rocks by the river at Beckermonds *Sedum villosum* (Hairy Stonecrop) is normally abundant. It was recorded from here when the Y.N.U. met in Upper Wharfedale in 1904. This year, both it and *Draba muralis* (Wall Whitlow Grass), which grows nearby, were in greatly reduced numbers, due no doubt to the prolonged rainless period during April and

May. Riverside pastures between Beckermonds and Oughtershaw were notable for the abundance of *Primula farinosa* (Bird's-eye Primrose) and *Gymnadinia conopsea* (Fragrant Orchid). Other species seen here were *Aquilegia vulgaris* (Columbine), *Draba incana* (Hoary Whitlow Grass), *Anthyllis vulneraria* (Kidney Vetch), *Salix repens* (Creeping Willow), and *Selaginella selaginoides.* In the wooded part of the ravine below Oughtershaw Hall, *Geranium sylvaticum* (Wood Cranesbill), *Crepis paludosa* (Marsh Hawksbeard) and *Cirsium heterophyllum* (Melancholy Thistle) were plentiful, but no plants were seen of *Pyrola rotundifolia* (Round-leaved Wintergreen) as recorded in Woodd's List (*Naturalist* 1889, 275). It was seen here during the 1904 visit of the Union, but has not been reobserved since. Another species recorded from here is *Melampyrum sylvaticum* (Small Cow-wheat), but this record is probably based on a misidentification. No specimens of the true plant, a much misrecorded species, are known from West Yorkshire.

The disagreeable conditions during the afternoon were compensated for by the interest of the terrain. The limestone pavements of the Helks above Beckermonds would repay further investigation. They were too wet and dangerous to receive the undivided attention of the party. *Galium boreale* (Northern Bedstraw) was reported as having been seen and an unidentified Pansy occurred in small numbers. *Viola lutea* (Mountain Pansy) has been recorded from here, but the purple-flowered plants seen seemed more like the Colt Park Wood *V. lepida* Jord. Above the pavements in the uncut meadows Melancholy Thistle was abundant and at its best, whilst *Trollius europaeus* (Globe Flower) was present in numbers rarely equalled elsewhere in Yorkshire. The *piéce de résistance* was *Leucorchis albida* (Small White Orchid) in good flower. The Wharfedale entry for this in Lees' *Flora* (1888) reads 'Oughtershaw in Langstrothdale, one plant', and it was again a single plant in 1980, for much searching then and on a return visit by me on the Monday failed to reveal additional specimens. Several plants of *Coeloglossum viride* (Frog Orchid) and *Platanthera chlorantha* (Greater Butterfly Orchid) were also seen here and Mr Jeremy Roberts found *Polygonum viviparum* (Viviparous Bistort). I have failed to refind this in Trevor Basil Woodd's Oughtershaw locality (*Naturalist* 1894, 285) so its presence in the fields between there and Beckermonds is a notable addition to its few other Wharfedale stations.

Sunday's excursion up the river above Oughtershaw was less productive but was carried out in much pleasanter weather. Much of the higher ground south of and almost down to the river is acid bog and upland pasture with a poor flora. Sundew and Bog Asphodel were present here. The sloping banks by the river below the degenerate woodland are more calcareous and hence provide the most interesting ground botanically. Here *Dactylorhiza purpurella* (Northern Marsh Orchid) was in good flower and hybrids with Spotted Orchid occurred. *Blysmus compressus* (Flat Sedge) was plentiful by the river and *Carex disticha* (Brown Sedge) and *Potentilla palustris* (Marsh Cinquefoil) were seen. On limestone rocks near Oughtershaw a few plants of *Sedum villosum* (Hairy Stonecrop) were reported and *Potentilla crantzii* (Alpine Cinquefoil) was seen in the station where Woodd first recorded it eighty-six years ago.

A number of species seen in the course of the weekend were additions to 34/88 and brought the total of new species recorded for this square to over fifty.

Plant Galls (F. B. Stubbs)

The small nail-like growths on the upper surface of the leaves of Bird Cherry were exceptionally abundant; these are mite galls, attributed to *Eriophyes padi padi.* Among other galls found were two quite local examples. On the upper stem of a plant of Lady's Bedstraw were galls of the midge *Geocrypta galii.* In the other case, many stems of the Creeping Willow were thickened and of a dark red colour, suggesting the action of a gall-midge of the genus *Rhabdophaga*, members of which are well known on other *Salix* species, A description and illustration in Buhr (1965) fit the present specimens, but the author ascribes the gall to '*Rhabdophaga*, species undetermined'. Unfortunately the growths were probably not sufficiently developed for the successful breeding out of adults, and further investigation is indicated.

Mycology (Mervin Nethercoat)

The Saturday having proved disastrous we looked to an improvement on Sunday as the clouds began to clear.

Collecting began with promise on the acidic eastern side of Oughtershaw Moss where a fine but immature *Agaricus haemorodarius* was found. The coprophilous species were naturally more abundant on the sheep-grazed slopes, but a single *Hygrophorus berkleyi* created interest. As we entered the old Scots pine and birch area by the river we were greeted by legions of *Dacrymyces capitatus* on pine logs but little else flourished in the coarse tussocks.

I would like to thank Joyce and Patrick Andrews for sharing the collecting and Willis Bramley for sorting out a couple of queries.

Bryology (T. L. Blockeel)

As might be expected, the area is rich in the typical bryophytes of upland limestone districts, but some of the more local species were also present. Rocks by the Oughtershaw Beck had *Schistidium alpicola* and a second *Schistidium* which may prove to be a form of *S. strictum*. Dry rocks away from the stream produced *Reboulia hemisphaerica* and *Fissidens cristatus*, while *Distichium capillaceum* was seen in several places on soil overlying the rock. *Breutelia chrysocoma* was in the damp grassland.

Among species from shaded rocks were the rather rare *Plagiopus oederi* and the hepatic *Plagiochila britannica*. The latter is a newly described species and is new to V.C. 64. This is the sixth Yorkshire record, indicating that it will probably prove widespread. It sometimes occurs, as in the present case, as isolated stems among the common *P. asplenioides*. Other records from the same habitat included: *Metzgeria pubescens*, *M. conjugata*, *Lejeunea cavifolia*, *Seligeria pusilla*, and *Plagiomnium cuspidatum*.

The area above the village of Oughtershaw was less productive. *Zygodon viridissimus* var. *viridissimus* was on trees in the village itself, and *Blepharostoma trichophyllum* on a flushed bank. In all, 103 species were recorded in spite of the difficult conditions during part of the meeting.

Garsdale (V.C. 65) (5th July) (F. Stubbs)

For this visit to an upland area, around 300 metres in altitude, the weather was fair but cool after an early shower. Some thirty members attended and twelve societies were represented. In addition the party was joined by several naturalists from Dent and Sedbergh with affiliations in Cumbria.

On the lands adjoining Clough River, to which access had been kindly given by Mr Calvert, the habitats were acidic in character, whilst in the afternoon the Hell Gill area provided more limestone sites. In most fields of study little previous work had been done and many additions were made to the appropriate lists, a few being of considerable interest.

After a most acceptable tea at the Moorcock Inn the President, Mr C. J. Smith, took the chair for the presentation of reports. It was agreed to draw the attention of the North Yorkshire County Highways Department to the value of certain sections of roadside verge on which were growing Bird's-eye Primrose, several species of orchid and other local plants.

Ornithology (G. E. Alderson)

Neither of the areas covered gave anything exceptional, but many birds had young. In the Clough River section were Kestrel, Jackdaw, Carrion Crow, Wood Pigeon, Lesser Black-backed Gull, Common Sandpiper, Grey, Pied and Yellow Wagtails, Dipper, Blackbird, Spotted Flycatcher, Wheatear, Willow Warbler, Wren, Chaffinch, Redstart (heard), Swift, Swallow, and Goldfinch.

The Hell Gill area did not produce as many species, but additions were among the typical birds of higher ground on the edge of moorland. These were Curlew, Lapwing, Golden Plover, Meadow Pipit, Skylark, and Linnet. Goldcrest was seen in a nearby plantation, and House Martins were flying near to Aysgill Cottages.

Mollusca (L. Lloyd-Evans)

Nineteen species of mollusca were found including five new to the 10-km square SD/79 in the molluscan Atlas. The tree slug *Limax marginatus* was enjoying the rich growth of corticolous lichens in the unpolluted air and the local *Limax cinereoniger* was flourishing on the wooded banks of the Clough River.

Lepidoptera (Mrs J.Payne)

Once again, the weather was not favourable for the lepidopterist. Only four butterflies were noted, the Large and Green-veined Whites, Small Heath and, as larvae, the Small Tortoiseshell. Chimney Sweeper, Silver-ground Carpet and Silver-Y Moths wre seen in a hillside meadow, and the Ghost Moth was photographed by a member. Trees and herbs in the area were remarkably free of signs of attack by Lepidoptera.

Coleoptera (M. Denton)

The weather was far from ideal for beetles, and collectors had to make do with stone turning and tree beating. Consequently twenty species of ground beetle were found, and as no recording has been carried out in this 10-km grid square, a full list is given.

Carabus violaceus, *Cychrus rostratus*, *Notiophilus biguttatus*, *Nebria gyllenhali*, *N. brevicollis*, *Loricera pilicornis*, *Clivina fossor*, *Bembidion redtenbacheri*, *Trecus obtusus*, *Patrobus excavatus*, *Abax ater*, *Cyrtonotus aulicis*, *Pterostichus madidas*, *P. diligens*, *P. nigrita*, *Anchomenus assimilis*, *A. ruficornis*, *Calathus fuscipes*, and *Synuchus nivalis*. Most of the species are considered to be common, although *S. nivalis* is said to be local, *N. gyllenhali* very local, and *B. redtenbacheri* very rare.

Three species of rove beetle were found, including the local *Olophrum piceum*. The inspection of sheep dung provided only two species, *Aphodius fuscipes* and *A. ater*. Click beetles were not much in evidence, and only four species were taken, *Cryptohypnus riparius*, *Agriotes obscurus*, *Athous haemorrhoidalis*, and *Selatosomus aeneus*. Except for a few weevils, the only species taken by beating were *Hydrothassa marginella*, *Crepidodera tranversa* and *Meligethes aeneus*.

Other Arthropods (D. T. Richardson)

In view of the fact that no records exist for grid square 34/79 it is felt that a detailed list of the findings is not out of place.

The morning was spent examining the river, small streams, riverside verges and a small patch of woodland below Low Scale (34/7790) where the ground was predominantly acid. The following species were collected: Woodlice — *Androniscus dentiger*, *Haplophthalmus mengei*, *Oniscus asellus*, *Porcellio scaber*, *Trichoniscus pusillus*; Centipedes — *Lithobius crassipes*, *L. forficatus*, *L. variegatus*; Millipedes — *Cylindroiulus punctatus*, *Glomeris marginata*, *Isobates varicornis*, *Proteroiulus fuscus*; Freshwater triclad — *Crenobia alpina*.

The afternoon was spent in Hell Gill (34/7997) and the adjacent fells where limestone outcrops were frequent. Woodlice — *Haplophthalmus mengei*, *O. asellus*, *P. scaber*, *T. pusillus*; Centipedes — *Lamyctes fulvicornis*, *Lithobius crassipes*, *L. lapidicola*, *L. variegatus*, *Geophilus carpophagus*, *Strigamia acuminata*; Millipedes — *Brachydesmus superus*, *Glomeris marginata*, *Polydesmus denticulatus*; Harvestmen — *Mitopus morio*.

A. dentiger and *L. forficatus* with their synthanthropic habits were, as would be expected, found in debris alongside a barn. *C. punctatus*, *I. varicornis* and *P. fuscus* under bark of decaying logs and *P. denticulatus* and *B. superus* under stones on calcareous soil. The presence of the rare *Halophthalmus mengei* in large numbers beneath stones in wet sandy gravel on the river bank was unexpected, this being an unusual habitat. Its presence in the thin soil-grass layer between the limestone flakes which capped the exposures was more in keeping. It is also considered unusual that only one specimen of freshwater triclad came to light; they are usually quite abundant in cool high altitude streams.

Flowering Plants and Ferns (W. A. Sledge)

One of the overlays provided with the first edition of the *Atlas to the British Flora* indicated those 10-km squares from which the number of records received, at the time the *Atlas* went

to the printers, was manifestly incomplete. The Garsdale square in which this meeting was held was one of those marked as being under-recorded, with less than 250 records submitted. It is certainly one of the less readily accessible areas, without a single village and with only one inn — The Moorcock — and that only just within its borders. Over 200 species of vascular plants were noted in the course of the day, and nearly one in three of these were additions to the *Atlas*.

The area adjacent to the Clough River in upper Garsdale was investigated in the morning. I failed to refind the *Pyrola minor* (Wintergreen) which I recall seeing under Birch trees on the Y.N.U. meeting here in 1929, and my impression is that a considerable amount of gill woodland fringing the river has gone in the intervening years. Beech Fern and Oak Fern were both seen, though not in the abundance which provoked comment in the report of the earlier meeting. *Oreopteris limbosperma* (Lemon-scented Fern) was plentiful, and *Asplenium viride* was seen in one place growing on non-calcareous rocks. The presence of calcicolous mosses, however, was evidence of the outward seepage of lime-impregnated water. In all, fifteen species of fern were seen, the best find being made by Mrs Payne, who detected several plants of *Ceterach officinarum* (Rusty-back Fern) on a wall by the road.

Plantanthera chlorantha (Greater Butterfly Orchid) was found in several fields, and Frog Orchid, Fragrant Orchid, Twayblade, and Common Spotted Orchid were the other orchids seen. *Cirsium heterophyllum* (Melancholy Thistle) was abundant and at its best. Other typical Dales flowers were *Geranium sylvaticum* (Wood Cranesbill), *Crepis paludosa* (Marsh Hawksbeard), a few plants of *Primula farinosa* (Bird's-eye Primrose) by the roadside at Garsdale Head, *Mimulus guttatus* (Monkey Flower), *Rumex longifolius* (Northern Dock), and *Salix pentandra* (Bay Willow). A less typical Dales plant was *Oenanthe crocata* (Hemlock Water Dropwort) of which several plants were seen by one stream at twice the upper altitudinal limit attributed to it in Lees' Flora. Eleven species of *Carex* were noted, but these and other flowering plants recorded were all widely distributed species.

At Hell Gill and thereabouts in the afternoon, about a score of species not noted in the morning were observed; these included *Lycopodium selago* (Fir Clubmoss), *Draba incana* (Hoary Whitlow-grass) and *Epilobium nerteroides* (New Zealand Willowherb).

Bryophytes (J. Robertson)

There is a rich moss flora in the Garsdale area. About one hundred species were recorded: only a fraction of those present. On boulders in the River Clough were: *Hygrohypnum luridum*, *Schistidium alpicola* var. *rivulare*, occasional *Fontinalis antipyretica*, the hepatics *Solenostema triste* and *Scapania undulata*, and along the banks, *Dichodontium pellucidum* and *Brachythecium glareosum*. On limestone walls and outcrops nearby were: *Neckera crispa*, *N. complanata*, *Orthotrichum diaphanum*, *O. anomalum*, *Tortula subulata* , *T. ruralis*, *T. muralis*, *Grimmia pulvinata*, *Tortella tortuosa*, *Bryum capillare*, *Homalothecium sericeum*, and *Ctenidium molluscum*. On wet, peaty slopes above the river grew *Plagiothecium undulatum*, *Dicranum majus*, *D. scoparium* and *Leucobryum glaucum*, with occasional *Rhytidiadelphus loreus*, *Calliergon stramineum*, and the hepatic *Lophozia ventricosa*.

In calcareous flushes above the river were luxuriant masses of *Gymnostomum aeruginosum*, *Cratoneuron commutatum* and *Plagiomnium affine* and in this area too *Bartramia pomiformis* was in fruit on some of the more acid rock ledges. On limestone rocks in a wooded tributary of the Clough were *Thamnobryum alopecurum* and the hepatics *Plagiochila britannica* and *Metzgeria pubescens*. On dripping sandstone further up this gill *Hyocomium armoricum* and the hepatic *Solenostema sphaerocarpa* flourished. Nearby, on bare vertical rock faces *Seligeria recurvata* fruited abundantly.

Gymnostomum aeruginosum was again a feature of dripping limestone in Hell Gill. The uncommon *Leucodon sciuroides* var. *sciuroides* was here too, on a dry stone wall. In the stream above the Gill grew *Fontinalis squamosa* and on the peaty slopes draining down into it were *Dicranella palustris*, *Lophozia incisa*, *Barbilophozia floerki*, and *Ptilidium caliare*.

Mr T. Blockeel has kindly acted as referee for this list.

SPRING FUNGUS FORAYS, 1978–1980

Bradford, 18–23 May 1978 V.C. 63
Ingleton, 10–14 May 1979 V.C. 64
Pickering, 1–5 May 1980 V.C. 62

T. F. HERING

In 1978 we welcomed the British Mycological Society for a joint foray, held at Bradford University. Some forty mycologists attended this event, and added quite a few species to the Yorkshire list, for which we thank them collectively.

Collation of the records from this joint foray has taken some time, and in the meantime two more spring forays have been held. In 1979 some twelve members concentrated on the north-west corner of the old county, using a workroom at Ingleborough Community Centre. Although unproductive in some ways (there were very few spring agarics) the area produced interesting finds, including the first British record of the discomycete *Pseudophacidium piceae*. In 1980 we returned to the favourite hunting-grounds of Mr W. G. Bramley at Pickering, using a workroom at the Parish Hall.

Over three years a number of people deserve thanks. I am particularly indebted to Mr B. Ing (Myxomycetes), Mr M. C. Clark and Mr J. Blunt (Ascomycetes) and Dr R. Watling (Basidiomycetes).

List of Sites

1978	H	=Harewood, SE/314413
	HB	=Hebden Valley, SD/968298
	BC	=Black Carr Wood, SE/200322
	O	=Ogden Reservoir, SE/065309
1979	AM	=Austwick Moss, SD/765676
	N	=Needlehouse Gill, SD/732967
	D	=Dentdale, SD/659899
1980	LD	=Low Dalby, SE/856874
	G	=Gundale, SE/803864
	N	=Newtondale, SE/814857
	K	=Kingsthorpe, SE/829858

*= new record for Yorkshire

Myxomycetes

Arcyria obvelata (78) H
Calomyxa metallica (78) HB
Cribraria rufa (78) H, HB, O
*Didymium iridis** (79) AM
Echinostelium minutum (78) H, HB
Hemitrichia calyculata (78) O
Lamproderma arcyrioides (78) BC
*Licea kleistobolus** (78) HB
*L. parasiticus** (78) HB
L. variabilis (78) O
Paradiacheopsis fimbriata (78) H, BC
*Reticularia intermedia** (78) H
*R. jurana** (78) H
*R. lobata** (78) H, BC
*Stemonitis typhina** (78) HB
*Trichia flavicoma**(78) HB
T. floriformis (78) H, HB, BC, O

Ascomycetes

Discomycetes

*Acrospermum pallidulum** (80) LD, G, N
*Apostemidium torrenticola** (78) HB, BC
Ascobolus brassicae (78) H
*A. carbonarius** (80) LD
*A. lignatilis** (78) BC
*Ascophanus granuliformis** (78) HB
*Cheilymenia raripila** (78) HB
C. stercorea (78) HB
Ciboria amentacea (79) AM
*C. betulae** (78) BC; (79) AM

Cyathicula pteridicola (80) N
C. turbinata (78) BC
Dasyscyphus acuum (78) H
D. carneolus var. *longipes* (79) AM
D. dumorum (78) H
D. fugiens (78) H, BC
*Discina perlata** (80) N
Disciotis venosa (78) H; (80) G, N
*Geopyxis pulchra** (80) LD
*Graddonia coracina** (78) HB
*Helotium stellariae** (78) O
*Hyaloscypha velenovskyi** (78) H
*Hymenoscyphus marchantiae** (79) N
H. vernalis (79) N
*Lachnellula subtillissima** (78) H, HB, O
*Lophodermium seditiosum** (78) HB
L. xylomoides (80) LD
Mollisia carduorum (80) LD
*M. clavata** (78) HB
*M. heterospermum** (78) BC
*M. juncina** (78) O
*M. palustris** (78) HB
M. pastinacae (78) BC
M. rehmii (78) HB
*Mollisina rubi** (78) BC
*Mollisiopsis dennisii** (80) LD
Morchella elata (80) LD
Ombrophila violacea (78) BC
Orbilia auricolor (80) K
Paxina acetabulum (78) H; (80) G
Pezicula livida (80) N
Pezizella alniella (78) H
P. amenti (79) AM
*P. chionea** (78) O
*P. fagi** (78) HB
P. gemmarum (80) LD
*Phacidiostroma multivalve** (79) N
*Ploettnera exigua** (80) K
*Pseudophacidium piceae** (79) N
*Psilachnum inquilinum** (78) BC
*P. tomi** (80) G
*Psilopezia babingtonii** (78) H, HB
Pyrenopeziza escharoides (78) BC
P. mercurialis (78) BC
P. petiolaris (80) G
*P. plantaginis**(78) H
P. rubi (78) BC
*Sarcotrochila alpina** (80) N
*Sclerotinia candolleana** (78) HB
*Spilopoda melanogramma** (80) D, G, N, K
*Stegia dumetii** (79) AM
Trichophaea hemisphaerioides (80) LD, N
*Unguicularia cirrhata** (78) HB

Loculoascomycetes
*Farlowiella carmichaeliana** (78) BC
*Gibbera myrtilli** (78) HB
Microthyrium cytisi var. *ilicis** (80) N
*M. microscopicum** (78) H; (80) LD, N
*M. pinicola** (78) O
*M. pinophyllum** (78) H
*Stomiopeltis betulae** (80) G, N
*S. pinastri** (78) HB

Pyrenomycetes
*Acanthonitschkia fistis** (80) G
*Bolinia lutea** (78) H
Ceratocystis piceae (78) O
Chaetosphaerella callimorpha (80) N
C. phaeostroma (78) H
Cordyceps gracilis (78) HB
Diatrype bullata (80) G, N
*Klasterskya acuum** (78) H
*Leptospora rubella** (78) HB
Nectria mammoidea (80) N
*Niesslia exilis** (78) H
*Plagiostoma pustulata** (78) H
*Trichosphaeria abundans** (78) H
Xylaria carpophila (78) H

Hemiascomycetes
*Taphrina cerasi** (78) O

BASIDIOMYCETES
Uredinales
Melampsora populnea (78) H
Puccinia adoxae on *Adoxa* (80) K
P. bistortae (79) D
P. chrysosplenii on *C. oppositifolium* (79) D
P. galii-verni on *Galium saxatile* (78) O
P. obscura on *Luzula sylvatica* (78) HB
P. maculosa on *Mycelis muralis* (80) K
Trachyspora intrusa on *Alchemilla* sp. (79) D; (80) G

Heterobasidiomycetes

*Calocera glossoides** (78) H
Exidia glandulosa (79) D

Aphyllophorales

Bjerkandera fumosa (80) N
Botryobasidium subcoronatum (78) O
Calyptella capula (80) N, G
Corticium evolvens (78) O
*Cristella farinacea** (78) HB, O
Fomes fomentarius (80) N
Hymenochaete corrugata (80) LD, G
Phanerochaete velutina (78) BC
Pistillaria uncialis (78) BC
Radulomyces confluens (78) BC
Rigidoporus sanguinolentus (78) BC
*Steccherinum fimbriatum** (80) N
*Tyromyces cinerascens** (78) O

Agaricales

Conocybe aporos (78) H; (80) G
C. sp. of. *tetraspora* Singer* (80) G, N
C. vexans (78) H
Coprinus cinereus (78) BC
C. domesticus (78) H
C. heptemerus (80) LD
*C. impatiens** (80) G
*C. romagnesianus** (78) H
C. stellatus (78) BC
Crepidotus herbarum (78) H
Entoloma aprile (80) N
*Galerina heimansii** (78) HB; (80) N
*Hypholoma ericaeoides** (78) BC
Melanoleuca cognata (80) G
Mycena amicta (80) N
M. pudica (78) BC
M. rubromarginata (80) LD
M. tortuosa (78) HB
*Nolanea juncina** (78) O
N. sericea (80) N
Panaeolus fimicola (80) LD
P. rickenii (80) N
Psathyrella pennata (78) HB
P. spadiceogrisea (80) S
P. subnuda (80) G
P. vernalis (78) H
Pseudohiatula esculenta (80) N
P. stephanocystis (78) H
P. tenacella (78) H
Tricholoma gambosum (78) H

Fungi Imperfecti

*Aphanocladium album** (78) BC
*Doratomyces nanus** (78) H
*Ramularia aequiroca** (78) BC
*R. cardamines** (78) O
Sphaeridium candidum (78) H
*Trimmatostroma scutellare**(78) H.

BOOK REVIEW

Philips' Illustrated Atlas of the World edited by **Bernard Stonehouse**. Pp. 208, including many full-colour plates. George Philip. 1980. £14.95.

A team of specialists has contributed informative texts, on a country by country basis, which highlight such topics as the landscape, climate, agriculture, development, population, and economy. The text is lavishly illustrated by colour plates and maps. The book has a short introduction covering the earth's surface, world climate and vegetation, and the human population. Additional statistical information is provided separately, and there is a useful gazetteer to the maps and an index to the text.

This is a most valuable source of geographical and environmental reference material which no school library should be without.

Yorkshire's Role in the Origin of some National Societies

The Society for the Bibliography of Natural History's Conference on the above topic will be held at Bradford on 21 November 1981. A full day's activities will include a morning lecture and discussion session held at the University of Bradford on the following aspects: Botanical Society of the British Isles (David Allen); British Conchological Society (Adrian Norris); British Mycological Society (Roy Watling); and British Ecological Society (Philip Lowe).

Short communications to follow these lectures are invited and participation in the subsequent discussion is welcomed. An edited version of the proceedings will appear in *The Naturalist*. There will also be an opportunity to see the important Herbarium of the British Pharmacological Society now housed in the University of Bradford, and during the afternoon a visit will be made to Leeds City Museum to see their Natural History Collections.

As places are strictly limited, advance payment of the conference fee (£5, to include morning coffee, sherry and luncheon) is requested as soon as possible. Cheques made payable to M. R. D. Seaward should be sent to the School of Environmental Science, University of Bradford, Bradford BD7 1DP.

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THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 15p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

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Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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FOOD AVAILABILITY AND FORAGING BY BUMBLEBEES (*BOMBUS* SPP.) AND HONEYBEES *(APIS MELLIFERA)* AT STRENSALL COMMON, YORKSHIRE

R. HEWSON and S. T. WALSH

Lyndhurst, Watson Street, Banchory, Kincardineshire

Introduction

Although heather moorland is an important source of food for both bumblebees (Brian, 1951) and honeybees (Maurizio, 1973), there appear to be no data on their food preferences on moorland or the availability of moorland plants to bees. This paper describes the seasonal distribution of foraging by bumblebees, *Bombus lucorum* (L.) and *B. pascuorum* (Scopoli), and honeybees, *Apis mellifera* (L.) on cross-leaved heath (*Erica tetralix*) and heather (*Calluna vulgaris*).

The Study Area

Strensall Common, about 8 km NNE of York, is one of the two remaining areas of acidic heathland in the Vale of York. It lies on a complex sequence of aeolian sands, lacustrine sands and clays, all overlying boulder clay (Ratcliffe, 1977). It has been used by the army since about 1881 as a training area and firing ranges. Earlier drainage had reduced the wetness of the area, and subsequent management for sheep by periodic burning of heather (which is dominant over most of the Common) has led to the virtual absence of old or degenerate heather. Heavy grazing by sheep has reduced flowering in some of the younger heather. *Erica tetralix*, usually with *Molinia caerulea*, is confined to damp hollows 100 m or more across. Certain plants important to bumblebees on moorland, *Vaccinium myrtillus*, *Erica cinerea*, *Pedicularis sylvatica* and *Succisa pratensis*, were not found on the study area. Annual rainfall is about 630 mm. The area sampled extended to about 24 ha on the north-east side of the Common.

Methods

Three transects, each about 100 m long and about 400 m apart, were set up in 1977 amongst *E. tetralix*, and alongside, or nearby, three corresponding parallel transects amongst *Calluna*. They were visited at approximately weekly intervals from June to late September in 1977 and 1978. On each visit flowering was assessed by counting the flowering, non-flowering, or withered shoots at intervals of five paces, scoring at each interval the flower shoot touching the front of the observer's boot. During its long flowering season some shoots of *E. tetralix* wither before peak flowering is attained; these were not counted in 1977 but were taken into account in 1978. The only effect is to reduce the number of flowers, and the data for the duration and peak of flowering remain comparable between years. The proportion of flowers apparently robbed by bees was counted on ten representative shoots from each transect in *E. tetralix*. Bees were counted along a strip *c.* 2 m wide on either side of the observer, and a few bees were collected for identification. Brief notes were made of weather conditions. *B. pascuorum* was also counted on *E. tetralix* and *Calluna* on three visits in September 1976.

The quantity of flowering shoots available on each transect was measured in September 1977, using a 625 cm^2 quadrat to count flower shoots and a 0.25 m^2 quadrat to estimate ground cover. On each transect, flower shoots of *E. tetralix* were counted in thirty quadrats, the more numerous shoots of *Calluna* in ten, and the height of the vegetation (to the nearest 1 cm) was measured in thirty quadrats. Ground cover was estimated by eye to the nearest 10 per cent in twenty quadrats along each transect.

Results

Flowering periods and pattern of foraging

The seasonal patterns of foraging varied from one plant species to another and from year to year in association with the flowering season. *E. tetralix* reached a peak of flowering about two weeks earlier in 1978 than in 1977, and *Calluna* about one week earlier (Figs 1 and 2).

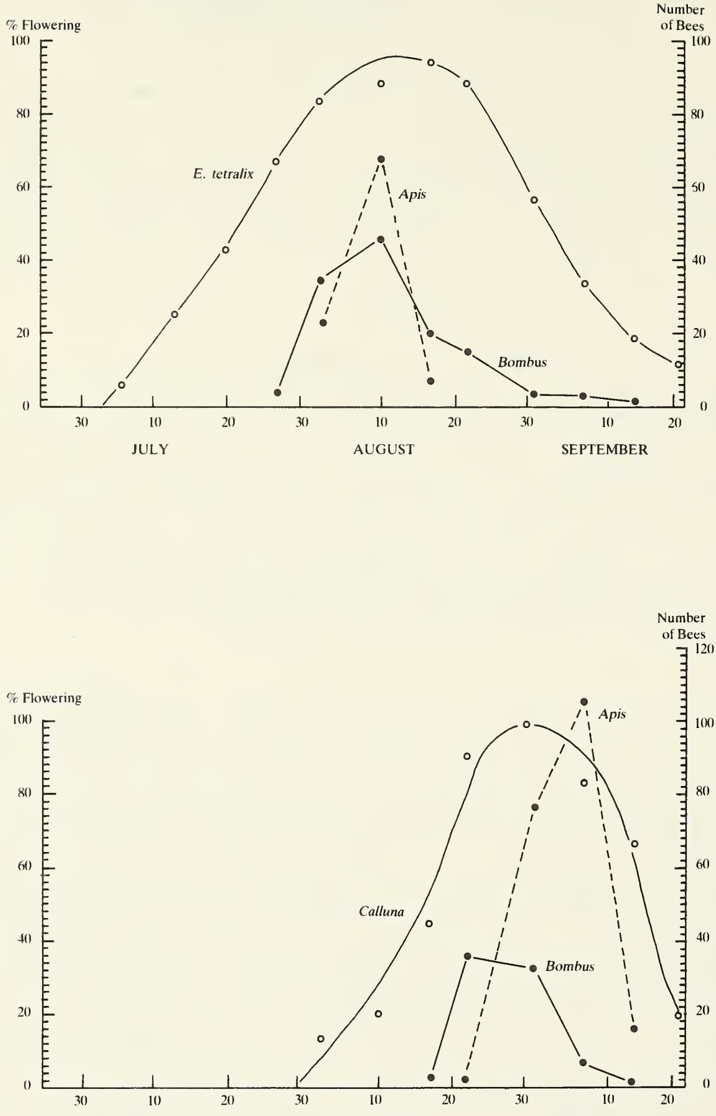

FIGURE 1
Foraging by bees in relation to the flowering periods of *E. tetralix* and *Calluna vulgaris* in 1977.

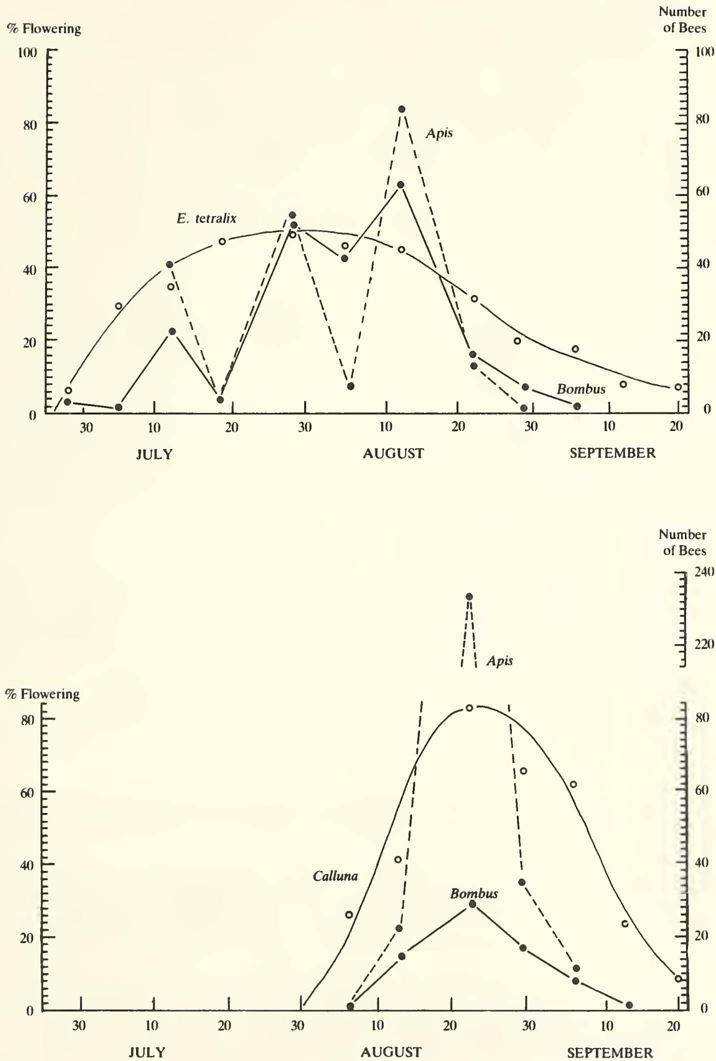

FIGURE 2
Foraging by bees in relation to the flowering periods of *E. tetralix* and *Calluna vulgaris* in 1978.

Bees foraged earlier and longer in 1978 than 1977, and this was related to the earlier flowering of *E. tetralix*. Bumblebees foraged longer in both years (56 and 77 days respectively) than honeybees (43 and 56 days) because they exploited *E. tetralix* earlier, but bees (and particularly honeybees) did not begin to forage on *E. tetralix* or *Calluna* until a substantial proportion (over half in 1977) of the plants were flowering.

The biggest numbers of bumblebees occurred about five days before the peak of flowering of *E. tetralix* in 1977 and about sixteen days after the peak in 1978. Male bumblebees were first seen on 23 August 1978, and they were also not seen until heather was in full flower on moorland in north-west Scotland (Hewson, unpublished data). The numbers of honeybees reached a peak at or slightly later than the peak of flowering in *Calluna*. The big reductions in the numbers of honeybees from time to time were associated with cloudy weather. Lundberg (1980) has shown that in a subalpine/alpine area of Sweden the combined effect of light and temperature was the chief factor regulating bumblebee flight activity, and this was probably the case at Strensall also, with honeybees more susceptible to cloud, wind and cold.

Available food and food preferences

On all three transects individual flowering shoots of *E. tetralix* carried about the same number of flowers, so that differences in the amount of pollen and nectar available were probably related directly to the number of flowering shoots per m^2. Transects A and B had similar ground cover and numbers of flower shoots (Table 1); C had less ground cover because *E. tetralix* occurred there in dense tall clumps in grassy areas. Although there were rather more flowers per shoot in 1978 than in 1977 (Table 2) the difference between years was not significant (Mann-Whitney test, U = 37).

TABLE 1

Flower shoots, cover and height of *Erica tetralix* and *Calluna vulgaris* at Strensall, September 1977 (means ± S.E.)

	Erica tetralix			*Calluna vulgaris*			
Transect	flower shoots /m^2	ground cover (%)	height (cm)	flower shoots /m^2	ground cover (%)	height (cm)	shoot length (cm)
A	273±35	58±5	15.5±0.6	896±242	87±6	21.8±1.0	2.1±0.2
B	298±44	56±5	15.5±0.6	664±128	73±5	9.0±0.6	2.8±0.3
C	228±54	21±5	20.4±0.9	1187±198	93±2	20.0±1.0	1.9±0.2

Transects A and C on *Calluna* were on heather in the building phases, i.e. up to about fifteen years old (Gimingham, 1972) with dense even ground cover and profuse flowering. Transect B was in the youngest, pioneer phase of more vigorous growth lasting normally up to six years.

TABLE 2

The number of flowers per shoot on *E. tetralix* throughout the flowering period (mean of 30 shoots, 10 from each transect) collected at approximately weekly intervals

	July				August				September	
	1	2	3	4	1	2	3	4	1	2
1977	9.3	9.4	9.0	9.8	9.3	9.4	9.8	9.4	9.0	9.9
1978	8.8	10.5	11.1	11.1	9.3	10.5	10.3	10.9	8.7	8.5

Length of flowering shoots varied between transects. A better estimate of the food available to bees can be obtained by multiplying the length of flowering zone by the number of flowering shoots per m^2. Transect C had more flowers (2255), than A (1882) or B (1859).

Carder bees preferred *E. tetralix* to *Calluna*. Of seven carders collected in 1978 all were *B. pascuorum*. They were never numerous. Of forty-two carder bees foraging in 1976 when heather was nearly at its peak of flowering and *E. tetralix* past its peak, thirty-three were feeding on *E. tetralix* (X^2 = 7.47, 1 d.f., $P<0.01$). Only six carder bees were seen on the study area in 1977, and thirty-four in 1978, of which thirty-one were on *E. tetralix* and three on *Calluna* (X^2 = 11.97, 1 d.f., $P<0.001$).

More white-tailed bumblebees (of twenty-seven collected in 1978 all were *B. lucorum*), foraged on *E. tetralix* during the season as a whole, than on *Calluna* (X^2 = 5.28, 1 d.f., $P<0.05$ for 1977, X^2 = 30.4, 1 d.f., $P<0.001$ for 1978), although they also foraged largely on *Calluna* after the peak of *E. tetralix* flowering.

Honeybees clearly preferred *Calluna* to *E. tetralix* in both years (X^2 = 17.2, 1 d.f., $P<0.001$ for 1977, X^2 = 21.1, 1 d.f., $P<0.001$ for 1978). Unlike bumblebees they rarely foraged on *E. tetralix* when more than 40 per cent of *Calluna* shoots were flowering (Figs 1 and 2).

Preferences between transects

More bumblebees foraged on the transect that had most flowers of *E. tetralix* per m^2, and least on transect C with fewest flowers and least ground cover (Table 3) but the difference was not significant in 1978 (X^2 = 19.1, 2 d.f., $P<0.001$ for 1977, X^2 = 4.16, 2 d.f., $0.20>P>0.10$ for 1978). However, the differences in the number of flowering shoots between transects was small (Table 1). Transect B, on pioneer heather, which was shorter and provided less ground cover, was the least frequented by bumblebees in both years, but again the difference was not significant in 1978 (X^2 = 51.18, 2 d.f., $P<0.001$ for 1977, X^2 = 5.29, 2 d.f., $0.1 >P> 0.05$ for 1978). Honeybees showed no consistency of choice between transects on *E. tetralix* or on *Calluna*.

TABLE 3

Numbers of bumblebees and honeybees on each 100 m transect on *E. tetralix* and *Calluna* during the flowering period

	Bumblebees					Honeybees			
	A	B	C	total		A	B	C	total
					E. tetralix				
1977	38	64	24	126		30	53	16	99
1978	68	73	51	192		48	46	67	161
					Calluna				
1977	56	7	15	78		65	18	118	201
1978	29	18	21	68		133	83	85	301

Robbing of E. tetralix

Bumblebees and honeybees both robbed *E. tetralix*, and many of the flowers had holes near the base of the corolla tubes (Fig 3). Holes were found before bees were seen on the transects, although they had been seen elsewhere on Strensall Common. Bumblebees also fed without robbing, and it was uncertain whether honeybees bit holes in corolla tubes or merely exploited holes already bitten. It is doubtful whether many bumblebees could reach the nectar of *E. tetralix* or bring about pollination (Procter and Yeo, 1973). *B. lucorum* has a tongue about 7–8 mm long (Brian, 1957) while the corolla tube of *E. tetralix* measured, on twenty Scottish specimens, 6.76 ± 0.09 mm (Hewson, unpublished data). Kwak (1977) gives a tongue length of 6.7 mm for *B. terrestis* (L.) workers, a bee of similar size. However, *B. lucorum* workers pay

few visits to flowers with a corolla tube of 7 mm and consistently rob *E. tetralix*, while all species of bees visit flowers with a corolla tube considerably shorter than their tongue (Brian, 1957). During 1978 at Strensall 144 white-tailed bumblebees were seen robbing, compared with forty-eight feeding normally (X^2 = 24.54, 1 d.f., P<0.001). Of the bees which were not robbing, sixty-five were carrying pollen and seventy-nine were not, a proportion not different from the fifteen out of forty-eight bees foraging normally (X^2 = 2.45, 1 d.f., NS).

Robbing began earlier and reached a peak sooner in 1978, when *E. tetralix* flowered earlier, than in the previous year. In both years robbing reached a maximum when most *E. tetralix* shoots were flowering, and before the greatest number of foraging bees, which was more closely associated with peak flowering of *Calluna*. *B. pascuorum* was not seen to rob *E. tetralix*.

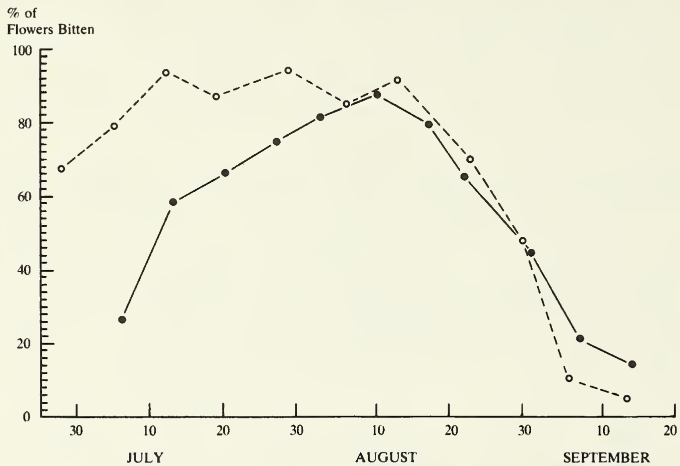

FIGURE 3
Robbing of *E. tetralix* by bees in 1977 (solid line) and 1978 (broken line).

Discussion

Heather moorland has few species of food plants for bees (although these plants are abundant), and Strensall Common, which lacked one of the most important plants, *E. cinerea*, provided an unusually limited habitat. However, the Common was surrounded by roadside verges and agricultural land where other plant species may have sustained bees, particularly before *E. tetralix* began to flower. There was no early food plant on the study area. The big variation in the numbers of foraging honeybees accords with good communication within the colony, allowing abundant food supplies to be rapidly exploited (Free, 1977), and with the marked effect of cloudy weather. A bumblebee colony relies upon individual initiative (Heinrich, 1979) and bumblebees forage in inclement weather (Wilson, 1929; Hewson, 1973), so their numbers should fluctuate less. Bumblebees foraged more selectively on *E. tetralix* and on *Calluna* than honeybees did, and may have assisted honeybees in exploiting *E. tetralix* by biting holes in the corolla tubes.

Carder bumblebees are not well adapted to moorland. The main food plants of *B. pascuorum* include no moorland species (Alford, 1975), although knapweeds and scabious occur in rough pasture at the edge of moorland. *B. pascuorum* also prefers sheltered places, which moorland seldom provides. As with *B. muscorum* (L.) on Scottish heaths (Hewson, 1979) it was uncommon, and varied greatly in numbers between years. Even when *Calluna* was in full flower, *B. pascuorum* foraged on *E. tetralix*, by then well past its peak.

The late appearance of *B. lucorum* males (and presumably the new queens), coincides with the greatest abundance of heather flowers, which is the biggest source of food on heather moorland. The disadvantage of this in the annual cycle of *B. lucorum* is that bad weather may restrict foraging at a critical time, and this may partly explain the fluctuations in the numbers of bumblebees from year to year. *B. pascuorum* and *B. muscorum* also forage late in the season, and vary widely in numbers.

There appears to be an over-abundance of heather in relation to its insect pollinators, but this is no disadvantage to the plant as it is largely wind-pollinated, although bees, thrips and other insects are important pollinators (Gimingham, 1960). While honeybee colonies are transported to exploit the heather harvest, bumblebee colonies on moorland are founded early in the season and have a limited or variable food supply before the heather flowers, so that numerous or big colonies are not available to feed from heather.

Acknowledgements

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BOOK REVIEWS

Plants for Shade by **Allen Paterson**. Pp. x + 214, with 4 plates of colour photographs. Dent. 1981. £7.95.

Allen Paterson firmly rejects the conventional gardening cliché 'the problem of shade', substituting instead 'the potential of shade', a concept which is fully explored in this admirable book. Introductory chapters — one of which, on shade-trees for gardens, is especially interesting — are followed by a series of lists of plants and shrubs for particular places and purposes, with informative descriptions. Not only is this a most useful book for anyone interested in designing a really attractive and restful garden, but the author's quietly witty style makes it a pleasure to read as well.

VAH

Collins Guide to the Pests, Diseases and Disorders of Garden Plants by **Stefan T. Buczacki** and **Keith M. Harris**; illustrated by **Brian Hargreaves**. Pp. 512 + 24 colour plates. Collins. 1981. £15.
A most valuable addition to any gardening bookshelf, price notwithstanding. Every conceivable pest, disease and plant disorder is described in detail, with the appropriate action needed to combat it. One can only be thankful that even the unluckiest gardener is unlikely to encounter more than a fraction of the possible troubles lying in wait to cause havoc and devastation in his garden! The definition of some of the illustrations is not as sharp as one might wish, and some are too reduced in size (e.g. plate 18) to be really helpful, which is a pity in an otherwise excellent reference book.

Nature Watch by **Julian Pettifer** and **Robin Brown**. Pp. 208, with numerous colour photographs. Michael Joseph. 1981. £9.95.
A great many people will have watched the excellent ATV series on which this book is based. Unlike the earlier rival series by David Attenborough for BBC-TV, it made no attempt to give a conspectus of the whole field of natural history: instead, a group of people whose lives are devoted to natural history and its conservation were invited to talk about their particular interests and enthusiasms, which ranged from the insect life to be found in a suburban Australian garden to studying the incredibly rich, but alas fast vanishing, wildlife of the Papua-New Guinea rain-forests.

Enough time has now elapsed for the memory of the TV pictures to fade sufficiently to allow the accompanying book to be judged on its own merits, and it must be said that the burning enthusiasm of the people involved, which made for such exhilarating television, does not really come across in this lightweight, journalistic text. Unlike the book designed to follow-up the Attenborough series, *Life on Earth*, this account does not provide much information additional to that given in the various programmes. The pictures, as one might expect, are superb, but that is hardly sufficient reason to make the book worth buying except as a reminder of the ATV series.

VAH

All Good Things Around Us. A beautifully illustrated cookbook and guide to the recognition and uses of over ninety wild plants and herbs, by **Pamela Michael**; illustrated by **Christabel King**. Pp. 240, including 87 coloured illustrations. Benn. 1981. £12.95.
Not only is this book a pleasure to the eye, but the many delicious-sounding recipes (over 380 of them, all personally tried out by the author and her publisher) will doubtless give pleasure to the inner man as well. Pamela Michael provides a seasonal calendar for plant gathering, and the eighty-seven full colour botanical paintings show the edible parts of the plants at their best time for picking.

Recommended, especially for winter reading, to conjure up the delights of summer and plan one's countryside forays.

A Millstone Round My Neck, by **Norman Thelwell**. Pp. 174, including numerous monochrome illustrations by the author. Eyre Methuen. 1981. £6.95.
This book will undoubtedly appeal to all those — and they must be many — who enjoyed this author's previous book on a similar theme, 'A Plank Bridge by a Pool' (*Naturalist* **104**:93). This is very much the mixture as before, but spread much thinner. The rather slight story line — Thelwell's struggles to make a derelict mill fit to live in, hampered by all and sundry — has to be padded out with fishing and other anecdotes to make a full length book, and the result seems a rather desperate straining to extract every possible ounce of humour from the situation. Not nearly as good as the earlier book, but nonetheless very readable.

The Ecology of Marine Sediments by **John S. Gray**. Pp. xi + 185, including numerous line drawings and tables. Cambridge Studies in Modern Biology 2, Cambridge University Press. 1981. £15 hardback, £6.95 paperback.
An introduction for those specializing in the structure and function of benthic communities, with emphasis on sampling, measurement (e.g. diversity, distribution, productivity, budgets), modelling and pollution.

JAMES BOLTON'S BOTANICAL PAINTINGS AND ILLUSTRATIONS, AND HIS ASSOCIATION WITH GEORG EHRET

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Introduction

James Bolton (d. 1799) of Halifax, who is generally described as an amateur naturalist and artist, was the author of the first monographs on British fungi and ferns, each illustrated with drawings he prepared and sometimes also engraved. In all, Bolton published three books: *Filices Britannicae; an history of the British proper ferns* (1785–90), *An history of fungusses, growing about Halifax* (1788–91) and *Harmonia ruralis, or an essay towards a natural history of British song birds* (1794–96).

Very little is known about Bolton's life such information as is available has been reviewed recently by Watling and Seaward (1981), who note that his date of birth is still unkown. According to an earlier biographer, Charles Crossland (1910), Bolton was 'an all-round naturalist who worked at his hobby in [Halifax] . . . for over forty years'. Crossland suggested that Bolton might have been a schoolmaster, but this cannot be confirmed, and Watling and Seaward (1981) consider that it is an unlikely profession for Bolton. However, a Mr Bolton was engaged by Mrs Mary Delany in 1779 as a tutor to her grand-niece, Miss Georgina Port, and it is probable that this was James Bolton.[1] The contemporary botanical collector, George Caley recorded that Bolton was a weaver by trade, and that for a few years, towards the end of his life, he ran a small public house (Henrey, 1975).

Bolton's training as an artist is shrouded, like his life story generally, in mystery. A contemporary diarist, Mrs John Ralph, wife of the incumbent of Northgate chapel (Watling and Seaward 1981), wrote that Bolton was a 'self-taught' artist and that he taught others to draw. Redgrave (1878) said that Bolton was a pupil of the mezzotint-engraver, Butler Clowes, but Watling and Seaward (1981) point out that this cannot be verified. What is certain is that Bolton spent much of his time collecting natural history specimens and painting them. The evidence presented in this paper might indicate that Bolton received some instruction in botanical illustration from Georg Ehret, although there is no direct evidence that these two men ever met. From the many paintings by Bolton which are extant, it is clear that at the least he supplemented his income, from whatever trade he pursued, by painting flowers, and that he probably accepted commissions from patrons of botanical art. Shear (1932) concluded that Bolton 'gained his livelihood chiefly as an artist, draughtsman and teacher of drawing', and it is known that in 1785 Bolton gave his profession as 'painter' (see note 9 in Watling and Seaward, 1981).

Bolton's Extant Paintings and Drawings

These may be grouped into two broad categories. Firstly, there are botanical illustrations, scientifically orientated drawings, often coloured, intended as the original artwork for publications. Secondly, there are numerous watercolours of wild and cultivated plants which were intended to be decorative, although they sometimes retained a scientific aspect. Bolton stated that his earliest botanical illustrations were done in 1761, but his earliest signed flower portraits date from about 1782. It is not intended to give a comprehensive catalogue of Bolton's surviving paintings, rather I wish to analyse their origins and attempt to assess the influences which acted in Bolton.

1. Scientific Illustrations

(a) Fungi

Bolton's monograph on the fungi found growing around Halifax was published in three volumes, with a supplement, between 1788 and 1791. The printed work was dedicated to the Earl of Gainsborough, to whom Bolton presented some of the original drawings. Six folio volumes, which are claimed to constitute the original manuscript and drawings, are now in the possession of the United States Department of Agriculture (Shear, 1932). These include 244

watercolours (the published work contained 182 plates figuring 231 species), dated between 1784 and 1792, so that this collection includes a number of paintings executed after the completion of the monograph.

There is a second set of drawings of fungi preserved in the Hunt Institute for Botanical Documentation, Pittsburgh: in two volumes are bound 229 drawings in watercolours and pencil. The manuscript title describes these as 'the primary sketches from Nature to Bolton's History of Fungusses . . . all drawn from Nature and mostly coloured'. This set was sold by Sotheby's in May 1939 (Watling and Seaward, 1981) on behalf of Captain F. C. F. Parker of Penrith. A third set of twenty-five drawings of fungi, with descriptions prepared between 1792 and 1794 (after the publication of *An history of fungusses*) is in the Botany Library, British Museum (Natural History). These originally belonged to Mr W. Horne (Crossland, 1910) who sold the drawings to the Museum in 1892. Only twenty-three of these could be traced by Watling, who has catalogued and discussed them (see Appendix 2 in Watling and Seaward, 1981).

(b) Ferns

Many of the original drawings of ferns used in *Filices Britannicae* are housed in the Botany Library, British Museum (Natural History).[2] But as with the illustrations of fungi, there are other drawings recorded. A volume auctioned by Christie's in 1977 was inscribed 'New figures of all the British Ferns most accurately copied from Nature by James Bolton'. The thirty-nine drawings executed between September and December 1795 (several years after the publication of his monograph), and in a manuscript preface Bolton explained that he '. . . did not think it necessary to describe the Plants in this manuscript, that work having already been done in my Felices [*sic*] Britannicae . . .' (Christie's sale catalogue, 13 July 1977, lot 273). The drawings in this set are said not to be merely reworkings of those published, but to 'show a completely new approach, and [to be] on a much larger scale'.

(c) Mosses

At the same auction in 1977 (lot 272), Christie's sold a volume titled *Genera Muscorum an illustration of the Families of Mosses in Figures taken from Nature & Magnified*. This contained twelve 'finely executed handcoloured drawings each with a leaf of description and references'. It may have been Bolton's intention to use these drawings in a book on mosses. Among the species depicted were two, which, according to Bolton's manuscript notes, had not been found in Britain at the time of drawing.

2. Flower Paintings

The decorative flower paintings by James Bolton almost invariably are executed in watercolour on vellum. They cannot be divided easily into taxomonic groups, and for this reason the following summary of the extant paintings is arranged according to the institutions which now possess the paintings.

(a) British Museum (Natural History), London

There is a bound volume of paintings by Bolton in the Botany Library, as well as some loose examples, in addition to the drawings of fungi and ferns noted above. The volume contains fifty black-and-white paintings of flowers executed between 1785 and 1787. The volume was 'inscribed and presented . . . to the Right Honourable the Earl of Gainsborough', but was later owned by Mr W. Horne who sold it to the museum in 1892. Bolton included a manuscript 'Advertisement' which concluded: 'The Drawing which represents a Flower Truly today will be a true representation of the same Flower as it will blow [bloom] when the Hand that drew it shall moulder in the Dust.' This collection is discussed further below.

(b) Lindley Library, Royal Horticultural Society, London

In March 1978, the Lindley Library received a bequest of an album of paintings by James Bolton. There are twenty-one watercolours in the collection, and the subjects are all cultivated plants. Two flower-pieces are included. Among the plants depicted are *Dionaea muscipula*

(Venus fly-trap) and *Fuchsia coccinea* (= *F. magellanica*) which was only introduced into cultivation about 1788. Sixteen of the paintings are signed or initialled but only five are dated.

(c) Royal Botanic Gardens, Kew

There is an unkown number of Bolton watercolours in the Royal Botanic Gardens, Kew. These are dispersed through the plate collection but some were incorporated in the herbarium until recently. One of the paintings depicts *Arbutus uva-ursi fructifera* (= *Arctostaphylos uva-ursi*).

(d) Fitzwilliam Museum, Cambridge

There are seven watercolours attributed to James Bolton in the museum. One of these was bequeathed by the Rt Hon Henry Broughton, Lord Fairhaven, and depicts *Cypripedium calceolus* (Lady's slipper orchid); it is inscribed 'Bolton Halifax 1793'. It seems that Bolton painted this orchid on several occasions for Crossland (1910: 5) noted that he owned a painting annotated 'This specimen grew in the garden of the late Rev. John Ralph at Halifax in June 1795' (Ralph died in April 1795 — see Watling and Seaward, 1981). The other paintings were given by A. A. Vansittart in 1862. Two ferns are included among these, as well as *Taxus baccata* (yew).

(e) Hunt Institute for Botanical Documentation, Pittsburgh

As well as the set of fungi (see above), the Institute possesses eighteen watercolours, one of which, depicting the 'Sickle-leaved Crinum', is reproduced in the catalogue of the library (no. 742).

(f) Pierpont Morgan Library, New York

In a biography of Georg Ehret, Calmann (1977) mentions that there are several flower paintings by James Bolton in the collection of Mr H. P. Kraus, now in the Pierpont Morgan Library. No other information is available.

(g) Chester Beatty Library, Dublin

This is the collection best known to the author, and the one which provoked this research. The single bound volume contains thirty-eight watercolours, fifteen of which are signed by Bolton and dated between 1782 and 1791. There is one painting of a marine invertebrate, titled 'The Purse Mollusc', which may not be by Bolton; it is not signed and the subject is not one which Bolton is known to have painted although he had a wide interest in natural history (Watling and Seaward, 1981). There is also a delightful vignette showing an open book of music lying on a post-horn and lute, encircled with wreaths of laurels and two garlands of flowers; beneath the music is a dark theatrical mask (? a death mask).

Three of the Dublin paintings show plants growing in flower-pots — labelled *Oxalis purpurea*, *Staphelia hirsuta* and *Galanthus nivalis*; the *Oxalis* painting is signed but not dated, whereas the other two are dated 1784 and 1783 respectively. There are three bouquets, only one of which is signed. The signed flower-piece includes a martagon lily, summer snowflake *(Leucojum)* and sweet pea, tied with a ribbon. There are six studies of *Primula* species, including cowslip *(P. veris)*, and named cultivars. Only one, showing the auricula 'Fordens Defence' is dated (1784) and signed. The other auriculas depicted are 'Smith's Marquis of Granby', 'Potts Duke of Bridgewater' and 'Severns Fame'.

Three of the Dublin watercolours include insects in their composition.[3] There is a strange, seemingly contracted painting of a foxglove (*Digitalis purpurea*) with a bee shown on the left. A painting of a rose includes a Peacock butterfly (*Nymphalis io*) resting on the stem of a bud, while one of a poppy cultivar shows another butterfly (possibly a Red Admiral, *Vanessa atalanta*).

Apart from miscellaneous studies of garden plants, there is also a painting of *Arbutus andrachne* (see below) and four studies of lilies; two of these, depicting *Lilium chalcedonicum* and *Crinum africanum*, are unsigned, but the other two are signed. Of most particular interest is the painting titled *Crinum zaylandicum* which bears two inscriptions: as well as 'J. Bolton *pinx.*' in the bottom left-hand corner may be read 'Ehret *del*:' (see Fig 1).

FIGURE 1
Crinum zaylandicum copied from an Ehret original by James Bolton. (Reproduced by permission of Chester Beatty Library, Dublin.)

Bolton and Ehret

There is no explicit record of any co-operative ventures in botanical illustration or flower painting undertaken by Georg Dionysius Ehret and James Bolton, although Calmann (1977) suggests that Bolton was a 'direct follower' of Ehret.

Ehret is widely regarded as one of the finest illustrators of eighteenth-century botanical publications, and as one of the best botanical artists of all time. He was born in Heidelberg on 30 January 1708. After working in various European countries, he settled in England in 1736, and remained there until his death in 1770. About 1752 he began to teach the young ladies of the nobility how to paint flowers. According to Calmann (1977) Ehret taught his pupils to keep their drawings together and to inscribe the pictures with the plants' correct botanical names. Among his aristocratic pupils were the Duchesses of Norfolk and of Leeds, two daughters of the Duchess of Bridgewater and two daughter of the Duchess of Portland. The Duchess of Portland, whose famous *salon* included Mrs Mary Delany, provides the probable connection between Bolton and Ehret.

James Bolton and his brother Thomas enjoyed the patronage of Margaret, Duchess of Portland; Watling and Seaward (1981) suggest that this arose because Thomas' friend, the Rev John Lightfoot, author of *Flora Scotica* (1777), was also employed by the Duchess as her chaplain and librarian. It is not improbable that James Bolton met Ehret at Bulstrode, the Duchess' residence, and that he learnt some of his artistic techniques directly from Ehret. However, there is no record that Ehret and Bolton ever met, and it is not known when Bolton entered the Duchess' patronage.

The *Crinum zaylandicum* painting in the Chester Beatty Library does not in itself prove any direct association between these two men. The inscription 'Ehret *del*:' is not in Ehret's distinctive handwriting, and probably indicates nothing more than that Bolton copied a drawing made by Ehret. Bolton admitted copying Ehret's work in the 'Advertisement' in the volume of black-and-white watercolours in the British Museum (Natural History), where Bolton wrote that '. . . it may not be improper to inform the Peruser of this Book, that all the Drawings contained in it (except Numbers three & four & 43) are originally Drawn by my own hand from an immediate and careful inspection of the natural objects'. The third drawing (*Gladiolus tristis*) is annotated 'This figure taken from a Painting by Ehret'. The fourth painting (*Iris ochroleuca*) is inscribed 'The figure is a copy after 'G. D. Ehret'. *Liriodendron tulipifera*, depicted in number forty-three, annotated 'Copied from G. D. Ehret'.

However, Bolton was not always so candid in his admission of sources. In the Chester Beatty Library collection there is a painting of *Arbutus andrachne*[4] which was certainly copied from a drawing that Ehret prepared for publication (1767; reproduced in Calmann 1977, Fig 58). The watercolour of *Gardenia* in the Chester Beatty Library bears remarkable similarities with the plate (tab XV) in *Plantae et Papiliones selectae* (Ehret, 1748; reproduced in Calmann (1977, Fig 83), as does the painting of *Crinum africanum* (tab X). Even more striking than these is the watercolour titled *Cactus flagelliformis* and dated 'Halifax 1782' with the signature 'J. Bolton pinxit' which is a copy of one by Ehret published in *Plantae et Papiliones selectae* (tab II); a similar engraved painting of this appeared in Trew's *Plantae Selectae* (1750: tab XXX reproduced in Quinby (1958), Fig 4). The copies are not always exact; artistic licence is evident in slight alterations, but in general the original source is obvious in the Bolton copy.

Not only did Bolton copy Ehret's work, but he was clearly influenced by Ehret's technique and style. This is shown in the *Primula* studies by Bolton in the Chester Beatty Library, which are similar in format to those Ehret painted in the earlier part of his career. Ehret also included butterflies in some of his paintings (see Calmann (1977) for examples).

Bolton as Artist

Bolton was an accomplished draughtsman, artist and engraver — his publications and extant paintings confirm this. One contemporary reviewer criticized Bolton's drawings of fungi saying that there was much of the naturalist and too little of the masterly artist in them (Crossland, 1910). Kraus (1976) considered that Bolton painted in 'a bold emphatic stlye'. However, his artwork could equally be described as solid and lifeless. His paintings have a flat appearance;

there are no nuances of shade, shadow or texture — even the flower pots have only two dimensions. This solidity and lack of naturalism in Bolton's paintings may be due to his copying. He seems even to have copied his own work, as shown by the two extensive collections of drawings of fungi.

It is not my intention to denegrate Bolton's botanical illustrations or flower paintings; both categories of work include fine examples of the respective genre. Clearly his output of paintings was substantial, and it may have been in an attempt to keep up a high level of production that Bolton copied other's works, especially those of Georg Ehret.

The link between Ehret and Bolton must be the Duchess of Portland, who clearly approved of Bolton and maintained her patronage of him. Bolton intended dedicating *An history of fungusses* to her — 'the Good Duchess Dowager of Portland'. Ehret had died in 1770 but the Duchess of Portland retained a vast collection of his drawings and paintings; Calmann (1977) estimated that 689 paintings by Ehret were sold at the famous sale of the Portland Museum in May 1786. While enjoying the Duchess' patronage, Bolton would have had access to these Ehret paintings, and could have copied some of them, even if he had not been at Bulstrode while Ehret was alive. Bolton may have been asked to make copies by other patrons, or he may have copied the paintings for practise, perhaps even for pleasure. There does not appear to have been any question of deceit nor are any accusations of plagiarism known.

Among these rather speculative statements about James Bolton, one thing is certain: Bolton did not always paint from living specimens. His rather solid, two-dimensional paintings may reflect his work as a copyist and engraver, and because of this his paintings do not achieve the reality of texture and form which such contemporaries as Georg Ehret accomplished.

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I am grateful to Dr R. Watling and Dr M. R. D. Seaward for their comments on an early draft of this paper. My thanks are also due to the Librarian, Chester Beatty Library, Dublin, for access to the volume of paintings and for permission to publish the photograph of one of them, and to Dr Gerta Callman, Harold Swann, David Davison (photography) and the staff of the Hunt Botanical Institute, British Museum (Natural History), Royal Botanic Gardens, Kew, Fitzwilliam Museum, Lindley Library, Messrs Christie, Manson and Woods Ltd, and Bernard Quaritch Ltd.

NOTES

1. Mrs Mary Delany would have met James Bolton at Bulstrode as she was a very close friend of the Duchess of Portland (see p xxx for discussion). The Mr Bolton whom Mrs Delaney employed as tutor is most probably James Bolton, although it might have been someone else; it was not Thomas, James' brother, as he died in 1778 (Crossland, 1910: 23). In a letter dated 27 February 1779 to Georgina Port's mother, Mrs Delany wrote that '. . . Mr Bolton has come every day, [and] is now with her [Georgina] . . .'. In a postcript she added that her grand-niece 'wants sadly to write to mama, but Mr. Bolton, who commends her "coming on", begs a little longer patience. . .'. On 6 March, Mary Delany wrote that '. . . Bolton commends his little schollar and will soon allow her to write to you, which in her mind she does hourly, as well as talk to you . . .'. Bolton eventually allowed Georgina to write to her mother on 20 March 1779; she wrote that '. . . I was so happy with your letter that I longed to write to dear mamma, but Mr. Bolton was cruel, tho' A.D. [Aunt Delany] is not; I am very happy here.' (Llanover, 1862: 406–17).
2. Banks ms 36
3. Crossland (1910) noted that Bolton had used butterflies in the composition of some of the paintings owned by W. Horne.
4. This painting is of particular interest as it was copied not from the engraved version, but from the original painting. This may be deduced because the Bolton copy is the reverse image of the engraving.

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ENTOMOLOGICAL REPORTS FOR 1979–1980

Hemiptera (R. Crossley)

Interest in Hemiptera continues to grow steadily and it is pleasing to be able to welcome new contributors to this report. During the two years under review some interesting additions have been made to the County list, the most important being *Anthocoris amplicollis* Horv. which is new to Britain. Full details of the discovery of this species, together with taxonomic notes, are to be published elsewhere (Crossley, R., *Anthocoris amplicollis* Horv. (Hem., Anthocoridae) new to Britain, *Entimologist's mon Mag*, in press). D. Horsfield's record of *Hebrus ruficeps* (Thoms.) is interesting because this minute *Sphagnum*-dwelling bug is easily overlooked, and the discovery of specimens in a Pennine locality should spur others to search in similar places, records hitherto having been confined to the lowland heaths at Skipwith, Allerthorpe and Strensall.

Records have been received from Messrs W. A. Ely, J. H. Flint, D. Horsfield, Dr L. Lloyd-Evans, Messrs K. R. Payne, and P. Q. Winter, to all of whom I express my thanks. In the lists which follow new county records are indicated thus † and new vice-county records thus *.

Heteroptera

† *Temnostethus pusillus* (Herr.-Sch.) There are numerous records for this species up to 1945 from vice-counties 62, 64 and 65 but none thereafter. These must, however, be considered doubtful following the separation of *Temnostethus gracilis* (Horv.) from *T. pusillus* in 1955. Authentic specimens of *T. pusillus* have now been taken as follows: (62) Ashberry, 9/8/80; R.C. (64) Rougemont Wood, Weeton, 5/7/80; R.C.

* *Elatophilus nigricornis* (Zett.) (64) Timble Ings, Otley, 13/7/80; R.C. Only one previous Yorkshire record for this conifer species (Sleights (62) 1937).

† *Anthocoris amplicollis* Horv. (62) Ashberry, 9/7/78 *et. seq.*; R.C. Lowna, Kirkbymoorside, 25/8/79; R.C. Pockley, Helmsley, 23/8/80; R.C.

* *A. butleri* Le Quesne (62) Castle Howard, 8/7/78; L.L-E.

A. minki Dohrn The introduction of *A. minki* as British in 1954 was incorrect, and true *minki* is not known to occur in these islands. The species formerly identified as *A. minki* is now known to be *A. simulans* Reut., (*Antenna* 2:21) and references to *A. minki* in Southwood, T.R.E. and Leston, D., 1959, *Land and Water Bugs of the British Isles*, Warne, should be amended accordingly.

† *A. simulans* Reut. The following records, originally reported under *A. minki*, are repeated for ease of reference. (61) Wauldby, 13/6/71; R.C. (63) Fishlake, 2/8/75; B.S. Nau. (64) Adel, 6/8/60; J.H.F. (65) Thornton Bridge, 23/6/73; J.H.F.

† *Amblytylus brevicollis* Fieb. (65) Muker Beck, 23/8/80; D.H.

* *Psallus luridus* Reut. (64) Nettlehome Wood, Skipton, ex Scots Pine, 31/8/80; D.H.

† *P. wagneri* Oss. (63) Maltby Low Common, 22/6/78; W.A.E. Elsecar, 21/6/79; W.A.E.

† *Pachytomella parallela* (Meyer-Dür) (65) Crossthwaite Common, 14/7/80; D.H. (*teste* R.C.). Mr Horsfield reports that the species was abundant on acid grassland.

Orthotylus virens (Fall.) (64) This species was first reported from near Collingham in 1978 (*Naturalist* 104:126). In 1979 it was found to be abundant on Bay Willow (*Salix pentandra* L.) at Dunsforth, Boroughbridge, 7/7/79; 4/8/79; R.C.

Orthops rubricatus (Fall.) (63) Langsett, ex Scots Pine, 5/9/80; D.H. There are several records for all five vice-counties but this is the first since 1937.

* *Hebrus ruficeps* (Thoms.) (64) Barden Fell, 20/7/80; D.H.

The following species are recorded for the first time in the vice-counties indicated but do not call for special comment:

V.C. 61: *Lygus wagneri* Rem.

V.C. 62: *Psallus perrisi* (Mulsant and Rey)

V.C. 63: *Megalocoleus molliculus* (Fall.); *Psallus perrisi* (Mulsant and Rey)

Homoptera

Mr J. H. Flint has kindly contributed the following notes and records. A 10 km square mapping scheme to cover Homoptera Auchenorhyncha has re-awakened interest in this suborder and there have been many additions to the county records as a result. An unusual number of additions, ten, has been made to the county list which now stands at 226, just over 60 per cent of the British total. Some of the additions to the county list are 'southern' insects while others, especially those reported by Mr Payne from the north-west, are 'northern' insects known from only a few, widely-scattered localities. Few of the Auchenorhyncha can be identified in the field; most require careful examination under the microscope. Closely related congeners frequently occur together so adequate population sampling is necessary and can produce most interesing results. Mr Ely's examination of a population of the common *Macrosteles sexnotatus* Fall. revealed the presence also of *M. ossiannilssoni* and the very rare *M. cristatus* (see below).

† *Oncopsis avellanae* Edw. (61) Cowlam Wold, 19/8/80; J.H.F. (64) Hellifield, 6/79; Kettlewell Bank and Yockenthwaite, 26/6/79; K.R.P.

† *O. subangulata* Sahl. (64) Askham Bog, 23/7/77; W.A.E. Yockenthwaite, 26/6/79; K.R.P.

* *Macropsis scotti* Edw. (63) Norwood Lakes, Rotherham, 21/8/78; W.A.E. The only previous Yorkshire record is from Skipwith Common.

* *Aphrodes trifasciatus* Fourc. (64) Burn Moor, 31/8/79; K.R.P.

* *Arocephalus punctum* Flor (61) Huggate, 9/8/80; Kiplingcotes chalk pit, 10/8/80; J.H.F.

* *Adarrus multinotatus* Boh. (61) Huggate, 9/8/80; J.H.F.

* *Psammotettix cephalotes* H.-S. (61) Kiplingcotes chalk pit, 10/8/80; J.H.F.

* *Paluda adumbrata* Sahl. (61) Kiplingcotes, 10/8/80; J.H.F.

† *P. flaveola* Boh. (64) Great Gap Marsh, 31/8/79; K.R.P.

† *Macrosteles cristatus* Rib. (63) Blue Man's Bower, Whiston, 1/9/79; W.A.E. Only known to Le Quesne (1969) from Kent and Hertfordshire.

† *M. ossiannilssoni* Le Quesne (62) Fen Bog, Goathland, 2/9/78; Ellerburn Bank, 15/6/80; J.H.F. (63) Blue Man's Bower, Whiston, 1/9/79; W.A.E. Brockadale, 9/6/80; J.H.F. (64) Malham Tarn, 7/56; J.H.F. Whernside, Burn Moor and Easington Fell, 31/8/79; K.R.P. First described in 1968, records indicated an upland, even montane distribution on acid ground. The Ellerburn and Brockadale records from calcareous grasslands indicate a wider range of habitats.

† *Cixius cambricus* China. (64) Oughtershaw Hill, 26/6/79; K.R.P. Montane; other records are from N. Wales and Scotland.

* *Kelisia punctulum* Kbm. (62) Ashberry Nature Reserve, 18/9/79; J.H.F. Rossington Bridge over sixty years ago is the only other Yorkshire record.

† *Muellerianella brevipennis* Boh. (64) Bowland Forest and Great Gap Marsh, 31/8/79; K.R.P.

† *Tyrphodelphax distincta* Flor (64) Helwith Moss, 24/5/80; J.H.F. An inhabitant of upland *Sphaghum* bogs.
† *Paraliburnia adela* Flor (64) Paythorne, 26/6/79; K.R.P.
† *Oncodelphax pullula* Boh. (64) Malham Tarn, 9/79; K.R.P.
Reference. Le Quesne, W.J. (1969) *Handb. Ident. Br. Insects*, 2 Pt. 2(b) : 143.

BOTANICAL REPORT FOR 1980

Flowering-Plants and Ferns

The recorders wish to thank all those who have submitted records for the year and have listed in their reports the more significant species. In each list, names of contributors are given the first time each occurs and thereafter initials are used. * new vice-county record.

East Yorkshire (V.C. 61) (E. Crackles)

The new vice-county record for *Cardamine impatiens* may well be an accidental occurrence as the species is well outside its previously recorded range. The record for *Myosurus minimus* on dried-out mud in a gateway at Elvington is of interest as this is the third such record for the Derwent valley in recent years; the plants apparently develop often in quantity from dormant seed in certain years but do not persist.

Myosurus minimus L. Elvington 44/74; P. Stuttard.
* *Cardamine impatiens* L. by chalk stream, Londesborough 44/84; R. Middleton.
Hypericum maculatum × *H. perforatum* = *H.* × *desetangsii* Lamotte near Broomfleet 44/82; F. E. Crackles.
Stellaria palustris Retz. Hornsea Mere 54/14, the plants are unusual in not being glaucous; F.E.C.
Atriplex glabriuscula Edmonston det. P. Taschereau, Barmston 54/15; E. Chicken.
* *Atriplex glabriuscula* Edmonston × A. prostrata Boucher ex D.C. det. P. Taschereau, Barmston 54/15; E.Ch.
* *Atriplex glabriuscula* Edmonston × *A. longipes* Drejer det. P. Taschereau, Barmston 54/15; E.C.
Astragalus glycyphyllos L. North Cave 44/83, two localities; E. Wear and F.E.C.
Lathyrus montanus Bernh. Pocklington 44/74; R. Gulliver.
Potentilla anglica × *P. erecta* = *P.* × *suberecta* Zimmet. Hasholme Carrs 44/83; F.E.C.
* *Saxifraga spathularis* Brot. × *S. hirsuta* L. = *S.* × *polita* (Haw.) Link Plants in Hunmanby Hall plantation are probably this hybrid, having arisen locally from the parents, naturalized here for over fifty years, the *S. hirsuta* present being an unusual form, det. Prof Webb 54/07; E.C.
Sison amonum L. by drain, Outstray farm, Patrington 54/31; F.E.C.
Humulus lupulus L. North Cave 44/83; E. W. and J. Spencer.
Amsinkia intermedia Fischer and C. A. Meyer Established in a number of places in southern Derwentland; additional records are; North Cliffe 44/83 and Elloughton 44/92; F.E.C.
Myosotis discolor Pers. Near Admiral Plantation, Uncleby 44/85; YNU Excn.
Echium vulgare L. Barmby on the Marsh 44/62; J.S.
Atropa bella-donna L. Southcoates Lane, Hull 54/13; R. Cracroft.
Pedicularis sylvatica L. Near Lockington 44/94; F.E.C.
Doronicum pardalianches L. Cherry Burton 44/94 and Birdsall 44/86; F.E.C.
Juncus gerardii Lois. Pasture, Hornsea Mere 54/14; F.E.C.
Luzula multiflora (Retz.) Lejeune Disused railway, Great Hatfield 54/14; F.E.C.
Dactylorhiza fuchsii (Druce) Soó × *D. purpurella* (T. and T. A. Stephenson) Soó Buckton 54/17; F.E.C.
Dactylorhiza maculata (L.) Soó Buckton 54/17; F.E.C.
Dactylorhiza maculata (L.) Soó × *D. purpurella* (T. & T. A. Stephenson) Soó Buckton 54/17; F.E.C.
Carex pilulifera L. King George Dock reservation, Hull 54/12; F.E.C.
Carex pulicaris L. Buckton 54/17; Miss S. Priest.

Festuca pratensis × *Lolium perenne* = × *Festulolium loliaceum* (Huds.) P. Fourn. Near Uncleby 44/85; YNU Excn.
Vulpia bromoides (L.) Gray Barmby on the Marsh 44/62; J.S.
Vulpia myuros (L.) C. C. Gmel. Near Barmby on the Marsh 44/62; J.S.
Puccinellia distans (L.) Parl. Verge at M1 junction roundabout 44/72; N. E. Scott.
Apera spica-venti (L.) Beauv. In three localities near Barmby on the Marsh, including the river bank 44/62; J.S.

North-East Yorkshire (V.C. 62) (T. F. Medd)
Equisetum sylvaticum L. Scugdale 45/50; YNU Excn.
Arabidopsis thaliana (L.) Heynh. Whitby 45/81; Miss J. E. Wilkinson.
Vaccinium oxycoccus L. Strensall Common 44/65 and 44/66; NCC Survey.
Trientalis europaea L. Scugdale 45/50; YNU Excn.
Gentiana pneumonanthe L. Strensall Common 44/65; NCC Survey.
Scrophularia umbrosa Dumort. River Foss, New Earswick 44/65; Mrs E. Bray.
Veronica polita Fr. Skelton, York 44/55; T. F. Medd.
Utricularia intermedia Hayne Strensall Common 44/65; NCC Survey (not in flower).
Scutellaria minor Huds. Strensall Common, confirmation for 44/66; NCC Survey.
Crepis paludosa (L.) Moench Scugdale 45/50; YNU Excn.
Dactylorhiza traunsteineri (Sauter) Soó 44/88; Mrs A. Wright.

South-West Yorkshire (V.C. 63) (D. R. Grant)
Asplenium adiantum-nigrum L. Canal wall, Mirfield 44/21; E. Thompson; Lumb Bank, Halifax 34/92; F. Murgatroyd.
Ranunculus auricomus L. Worsborough, Barnsley 44/30; D. R. Grant.
Rorippa amphibia (L.) Bess. Battyeford, Mirfield 44/12; T. Schofield.
Saponaria officinalis L. Canal, Kilnhurst 44/40; E.T.
Stellaria palustris Retz. Near Steeton 44/02 D.R.G.
Chenopodium bonus-henricus L. Mitchell Laithes, Dewsbury 44/22; C. Braham.
Gernium lucidum L. Colden Valley, Hebden Bridge 34/92; F.M.
Impatiens parviflora D.C. Dewsbury 44/22; E.T.
Euonymus europaeus L. Near Cawthorne 44/20; Dr L. Lloyd-Evans.
Ulex gallii Planch. Silkstone Common 44/20; D.R.G.
Ononis repens L. Old Brodsworth 44/50; D.R.G.
Trifolium arvense L. Dodworth Bottom 44/30; E.T.
Rubus chamaemorus L. Near Boulsworth Hill 34/93; Miss N. Hirschel.
Sorbus torminalis (L.) Crantz Worsborough, Barnsley 44/30; A. Blunt (bird sown).
Foeniculum vulgare Mill. Brampton Bierlow 44/40; E.T.; Askern 44/51; D.R.G.; Dewsbury 44/22; D.R.G.
Pimpinella saxifraga L. Jagger Green, Stainland, 44/01; T.S.
Parietaria diffusa Mert. and Koch Worsborough, Barnsley 44/30; A.B.
Humulus lupulus L. Hunsworth, Cleckheaton 44/12; T.S.; Little Horton 44/90; D.R.G.
Populus tremula L. Cudworth Common 44/40; D.R.G.
Primula vulgaris Huds. Kelbrook 34/94; T.S.; Hipperholme 44/12; F.M.
Scrophularia umbrosa Dumort. Near Steeton 44/04; D.R.G.
Sambucus ebulus L. Canal, Kilnhurst 44/49; E.T.
Luronium natans (L.) Raf. Canal, Huddersfield 44/11; B. and J. Lucas.
Alisma lanceolatum With. Canal, near Brighouse 44/12; T.S.
Butomus umbellatus L. Canal, Barnoldswick 34/84; D.R.G.
Elodea nuttallii (Planch.) St John Canal, Huddersfield 44/11; B. and J.L.
Potamogeton pectinatus L. Wath on Dearne 44/40; E.T.
Potamogeton obtusifolius Mert. and Koch Old Canal, Brampton Bierlow 44/40; D.R.G.
Juncus tenuis Willd. Cleckheaton 44/12; T.S.
Dactylorhiza fuchsii (Druce) Soó Mirfield 44/21; E.T.
Acorus calamus L. Battyeford, Mirfield 44/12; T.S.

Scirpus maritimus L. Worsborough Reservoir 44/30; A.B.
Scirpus sylvaticus L. Worsborough Reservoir 44/30; YNU Excn.
Scirpus tabernaemontani C. C. Gmel. Nostell Priory Lake, Wakefield 44/41; YNU Excn.
Carex laevigata Sm. Long Causeway, Sheffield 44/28; D.R.G.; Denholme 44/03; T.S.
Carex pseudocyperus L. Nostell Priory Lake, Wakefield 44/31; L.L.E.
Carex pallescens L. Near Birdwell 44/30; A.B.; near Earby 34/94; D.R.G.
Carex caryophyllea La Tourr. Near Silkstone 44/20; L.L.E.
Carex spicata Huds. Thornton in Craven 34/94; D.R.G.
Carex otrubae Podp. Northorpe, Dewsbury 44/22; E.T.
Phragmites communis Trin. Wath on Dearne 44/40; E.T.
Vulpia bromoides (L.) Gray Near Worsborough Reservoir 44/30; YNU Excn.
Puccinellia distans (L.) Parl. Cudworth Common 44/40; D.R.G.
Poa compressa L. Thornton in Craven 34/94; D.R.G.

Mid-West Yorkshire (V.C. 64) (J. R. Hickson)
Aquilegia vulgaris L. Near Beckermonds, Buckden 34/88; YNU Excn.
Rorippa amphibia (L.) Bess. Bolton Percy 44/54; D. R. Grant and T. Schofield (1979).
Myriophyllum spicatum L. Chelker Reservoir, Draughton 44/05; L. Magee.
Polygonum viviparum L. Near Beckermonds, Buckden 34/88; YNU Excn. conf of pre-1930 record.
P. mite Schrank Newton Ings, Ledsham 44/42; I. Instone (1979) conf D.R.G.
Atropa bella-donna L. Allerton Mauleverer 44/45; D.R.G. and T.S.
Alisma lanceolatum With. Bolton Percy 44/54; D.R.G. and T.S. 1979.
Butomus umbellatus L. Leeds/Liverpool Canal, Barnoldswick 34/84; D.R.G.
Groenlandia densa (L.) Fourr. R. Wenning, Clapham 34/76; F. J. Roberts.
Juncus tenuis Willd. Near Kex Beck, Hazlewood, near Beamsley 44/05; D.R.G.
Coeloglossum viride (L.) Hartm. Near Beckermonds, Buckden 34/88; YNU Excn.
Leucorchis albida (L.) E. Mey. ex Schur Near Beckermonds, Buckden 34/88; YNU Excn., conf of pre-1930 record.
Vulpia myuros (L.) C.C. Gmel. Disused airfield, Acaster Selby 44/54; D.R.G. and T.S.
Poa compressa L. Helwith Bridge, Horton in Ribblesdale 34/86; T.S.

North-West Yorkshire (V.C. 65) (T. F. Medd)
Verbascum nigrum L. Kiplin, Great Langton on Swale 44/29; Mrs F. Houseman.
Gagea lutea (L.) Ker-Gawl. By R. Ure, Kilgram Bridge 44/18; F.H.
Juncus filiformis L. Grassholme Reservoir 35/92; R. Hobbs.
Platanthera chlorantha (Custer) Reichb. Swaledale per F. B. Stubbs.
Carex hostiana D.C. Hauxwell Moor 44/19; Mrs D. Haythornthwaite.
Glyceria plicata Fr. Hipswell 44/19; D.H.
Glyceria declinata Bréb. With the above.

Casuals and Adventives (E. Chicken)
Ninety-two records (fifty-one species from seventy-four sites) have been received from ten observers. Few of these are particularly unexpected, being mostly well-known garden plants or aliens of frequent occurrence. The following is a list of selected species. Vice-county numbers are given in parentheses.
Cardaria chalepensis (L.) Hand.-Mazz. (61) R. Humber bank 54/02; E. Chicken.
Iberis umbellata L. (63) Near Broad Canal, Huddersfield 44/11; Mrs J. Lucas.
Arabis caucasica Willd. (64) Forest Moor 44/15; Mrs F. Houseman.
Hypericum xylosteifolium (Speck) N. Robson (64) Monkton Moor 44/36; F.H. det. N. Robson.
Atriplex hortensis L. (62) Roadside near Aldwark 44/46; F.H.
Malva pusilla Sm. (61) By Pocklington Canal 44/74; R. Gulliver.

Lathyrus latifolius L. (63) By canal, Brighouse 44/12; D.R.G.
Rosa rugosa Thunb. (64) Forest Moor 44/15; F.H.
Spiraea salicifolia L. (61) West bank of R. Derwent, Wheldrake 44/64; Miss J. Lambert.
Spiraea × *vanhouttei* (Briot) Zabel (64) Fewston Reservoir 44/15; F.H.
Lythrum hyssopifolia L. (61) Garden weed, Hull 54/03; E. Wear per Miss F. E. Crackles.
Epilobium pedunculare A. Cunn. (62) Goathland Moor 44/89; Miss J. E. Wilkinson per T. F. Medd.
Coriandrum sativum L. (63) Tip at Huddersfield 44/11; J.L.
Ficus carica L. (63) Earlsheaton, Dewsbury 44/22; D.R.G.
Polemonium pauciflorum Watson (61) Garden weed, Hull 54/13; B. Smart comm. F.E.C. det J. Lewis (1979).
Borago officinalis L. (64) Near Otley 44/25; F.H.
Pulmonaria rubra Schott (64) Woodland near Grantley 44/27; F.H.
Verbascum speciosum Schrad. (62) Near Aldwark 44/46; F.H.
Dipsacus sativus (L.) Honckeny (61) By seed warehouse, High Street, Hull 54/12; F.E.C.
Solidago graminifolia (L.) Salisb. (61) King George Dock Reservation, Hull 54/12; F.E.C.
Egeria densa Planch. (63) Canal at Brighouse 44/12; D.R.G.
Lilium pyrenaicum Gouan (65) Woodland by stream to Semmerwater 34/98; F.H.
Triticum aestivum L. (63) Tip, Huddersfield 44/11; J.L.
Hordeum distichon L. (63) Tip, Huddersfield 44/11; J.L.
Avena sativa L. (63) Tip, Huddersfield 44/11; J.L.
Setaria verticillata (L.) Beauv. (61) High Street, Hull 54/12; F.E.C.
Setaria lutescens (Weigel) Hubbard (61) High Street, Hull 54/12; F.E.C.

FIELD NOTE

A remarkable assemblage of Hover-flies

On 18 April 1981 I visited the southern edge of the woodland at Timble Ings, about six miles north-west of Otley, to search for early hover-flies (Diptera: Syrphidae). The afternoon was warm and sunny and a group of four or five sallow bushes in a marshy corner of a recently clear-felled area looked a likely place for specimens. On closer inspection, one bush in particular, which was heavy with flowering male catkins, was found to be attracting large numbers of flies, and during the course of about three hours I collected from it nine species of Syrphidae. The most abundant were *Eristalis pertinax* (Scop.) and *Melangyna lasiophthalma* (Zett.), and the remaining species included a single *Cheilosia grossa* (Fall.) and several *Melangyna quadrimaculata* (Verr.), both of which only occur in early spring and are often missed by collectors; also *Platycheirus discimanus* Loew, an uncommon and locally distributed spring species.

Other syrphids taken were *Syrphus torvus* Osten-Sacken, *Platycheirus albimanus* (Fab.), *Eristalis intricarius* (L.) and *Criorhina ranunculi* (Panz.). *C. ranunculi* is a large, hairy bee-like hover-fly which was described by G. H. Verrall eighty years ago as, 'perhaps the grandest of all our British Syrphidae'. The species is rare in Yorkshire (or, perhaps I should say 'rarely found'), and until recently there were only two records for the county, these being Hovingham in the 1860s and Pateley in 1924. Since 1972 it has been recorded from the Sheffield district and at Ashberry. The Timble Ings specimen is a male of the 'white tailed' form.

In the north of England it is rare to experience in early spring such a perfect combination of circumstances as I have described; certainly I have never before been so fortunate in more than twenty years of collecting. I am obliged to Mr P. Skidmore for information on the Yorkshire records of *C. ranunculi*.

Roy Crossley

A NOTE ON PHYTOPLANKTON IN THE RIVER HULL AT HEMPHOLME, NORTH HUMBERSIDE

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Introduction

A substantial community of truly-planktonic algae (i.e. having originated by cell division in the water column) is sometimes present in major lowland English rivers; e.g. the Lee (Swale, 1964), Stour, lower Severn (Swale, 1969), Thames (Lack, 1971), and Avon (Moore, 1976; Aykulu, 1978). This community is frequently dominated by centric diatoms and is most successful during the spring to autumn period (when light conditions are favourable) at times when discharge is low and there is, therefore, a high retention time of water within the river system.

In contrast, in smaller fast-flowing waters the phytoplankton consists mainly of pennate diatoms which have been detached from surfaces within the river; e.g. Belle Grange Beck, Cumbria (Douglas, 1958), the Bere Stream and the R. Frome, Dorset (Marker and Gunn, 1977). Here any seasonal variation in abundance depends on variation in the rate of release from the attached community. Substantial truly-planktonic populations do not develop, probably because the retention time is too short to allow sufficient cell division.

There are also rivers which appear to be intermediate between the two above extremes; e.g. the upper Severn (Swale, 1969) and the Kennet (Lack, 1971). In these, pennate and centric diatoms may be successively dominant in the phytoplankton, depending on whether release from surfaces, or cell division in the water column, is the current most important source of recruitment.

The purpose of this present note is to record the results of observations made throughout 1975 and 1976 on phytoplankton in the R. Hull at Hempholme, North Humberside. The phytoplankton at this site is potentially of interest because although the R. Hull here is apparently a typical lowland river it forms the downstream end of a short and largely fast-flowing system with short retention time.

Description of Site

The R. Hull is spring fed from beneath the eastern slopes of the Upper-Cretaceous chalk of the Yorkshire Wolds. Driffield Beck and Driffield Trout Stream flow for *c.* 3.5 km and 5 km from their respective sources, and receive several minor tributaries, before merging near Great Driffield to form the R. Hull (or West Beck). The river then flows for *c.* 13 km to its tidal limit at Hempholme Weir. A major tributary, Frodingham Beck, joins 2 km upstream of the weir. The Driffield canal, which flows slowly for 7.5 km, joins Frodingham Beck *c.* 1 km upstream of its junction with the R. Hull. The upper R. Hull is typically a shallow, fast-flowing, chalk stream with a macrophyte vegetation dominated by *Ranunculus peltatus* ssp. *pseudofluitans* (Syme) C. Cook; only for *c.* 7 km upstream of Hempholme Weir is the river deeper, embanked and more slow flowing.

The site sampled was Bethell's Bridge (Grid Ref. TA 079 511), 1.1 km upstream of Hempholme Weir. The river here is *c.* 20 m wide and 2 m deep; average discharge over 1975–1976 was 2.75×10^5 m^3 day^{-1} with a range of 0.39 to 8.15×10^5 m^3 day^{-1}. Water quality here is typical of a calcareous river; the mean (and range) of pH over 1975–1976 was 7.6 (7.3 to 8.3) and that of conductivity was 408 (326 to 544) μmhos cm^{-1} (Goulder, 1980). Chemical data, supplied by the Yorkshire Water Authority for samples from Hempholme Weir, indicate that the inorganic nutrients needed by phytoplankton are in good supply; e.g. during 1975–1976 the mean (and range) for silica was 5.4 (2.0 to 9.0) mg l^{-1}, for nitrate-N 5.8 (0.1 to 15.4) mg l^{-1}, and for phosphate-P 0.20 (<0.01 to 6.5) mg l^{-1}.

The macrophyte vegetation at Bethell's Bridge is typical of a lowland river. There are reed margins of *Glyceria maxima* (Hartm.) Holmberg, and a rich submerged vegetation of mainly *Potamogeton lucens* L., *P. crispus* L., the submerged form of *Nuphar lutea* (L.) Sm., *Elodea*

canadensis Michx., *Ceratophyllum demersum* L., *Callitriche* sp., and *R. peltatus*. Macrophytes which remain submerged in normal years (*Nuphar* and *Potamogeton*) reached the surface in the dry summer of 1976 and formed a dense cover which persisted throughout July and August.

Methods

Samples of surface water were collected at Bethell's Bridge at about fortnightly intervals from January 1975 to December 1976.

To measure the concentration of phytoplankton chlorophyll *a*, two replicate 2–1 sub-samples were filtered, using Whatman GF/C glass-fibre filters. Any obvious macrophyte fragments or macroscopic algal filaments were removed and pigments were then extracted overnight into 90 per cent methanol at 1–3°C. Chlorophyll *a* was then determined spectrophotometrically (Talling, 1969). There was no separation of chlorophyll *a* from its degradation product, phaeophytin, hence the values obtained may be overestimates of the true chlorophyll *a* concentration.

To determine the concentration of microscopic algal cells, or colonies, the phytoplankton was concentrated 100× by sedimentation with Lugol's iodine solution. Cells or colonies were then counted in a Fuchs-Rosenthal haemacytometer. The accuracy of each estimate of cell concentration depends on the number counted; in the work reported here, for example, the 95 per cent confidence interval around an estimate of 200 cells ml^{-1} is 154 to 248 cells ml^{-1} while that around an estimate of 20 cells m^{-1} is 9 to 38 cells ml^{-1}.

To determine the concentration of large *Oscillatoria* filaments, 0.05 ml of the 100× concentrate was transferred to a microscope slide and covered by a cover-slip; the entire preparation was then scanned and filaments were counted.

Discharge at Bethell's Bridge was calculated from data on abstraction and discharge at Hempholme Weir provided by the Yorkshire Water Authority.

Results and Discussion

Concentrations of chlorophyll *a* are given in Fig 1a; peak values occurred in May and September 1975 and in June, August and October 1976. The absolute concentrations recorded were low in comparison with those in larger lowland rivers. The highest value obtained at Bethell's Bridge (10.2 mg m^{-3} on 8 June 1976) contrasts markedly, for example, with chlorophyll *a* maxima (not including phaeophytin) of 219 mg m^{-3} in 1968 and 197 mg m^{-3} in 1970 in the R. Thames (at Reading, 150 km downstream of the source) and of 38 mg m^{-3} in 1968 and 62 mg m^{-3} in 1970 in the R. Kennet (Kowalczewski and Lack, 1971; Lack and Berrie, 1976). The low concentration of chlorophyll *a* accounts for the extreme clarity of the water at Bethell's Bridge where throughout 1975–1976, apart from exceptions during times of high discharge, detail of the river bed was clearly distinguishable at 2 m below the water surface.

Concentrations of pennate and centric diatoms are given in Fig 1b, and those of flagellate cells (Chlorophyta and Cryptophyta) and non-motile Chlorophyta in Fig 1c. In the case of this last group a single cell or a colony was counted as one unit. The results show that pennate diatoms (maximum 359 cells ml^{-1} on 26 October 1976) were the most important component of the phytoplankton. The chlorophyll *a* peaks (except for that in June 1976) appear to be a result of a raised concentration of pennate diatoms. At these times many species of pennate diatoms were observed. The most conspicuous were as follows: *Synedra ulna* (Nitzsch.) Ehr. in May 1975; *Cocconeis placentula* Ehr. and *Rhoicosphenia curvata* Grun. in September 1975; *Nitzchia* sp., *C. placentula* and *Navicula cryptocephala* Kütz. in August 1976; *S. ulna* in October 1976. Centric diatoms (mainly *Cyclotella meneghiniana* Kütz.) were much less important than pennate diatoms, being present only at low concentrations in both 1975 and 1976. Flagellate cells and non-motile Chlorophyta (e.g. *Ankistrodesmus* sp., *Scenedesmus quadricauda* (Turp.) Bréb.) appear to have been largely responsible for the June 1976 chlorophyll *a* peak and they also contributed to the peak in August 1976.

A notable feature at Bethell's Bridge on 8 June 1976 was the presence of floating masses of brownish-green flocculent material which occupied perhaps 2 to 5 per cent of the river surface. These proved to be made up of the filaments of a large *Oscillatoria* species (trichome diameter *c.* 15 μm), possibly *O. limosa* (Roth) Agardh. Examination of the 100 × concentrates from around this period (25 May to 30 June 1976) showed that these filaments were also present in the water

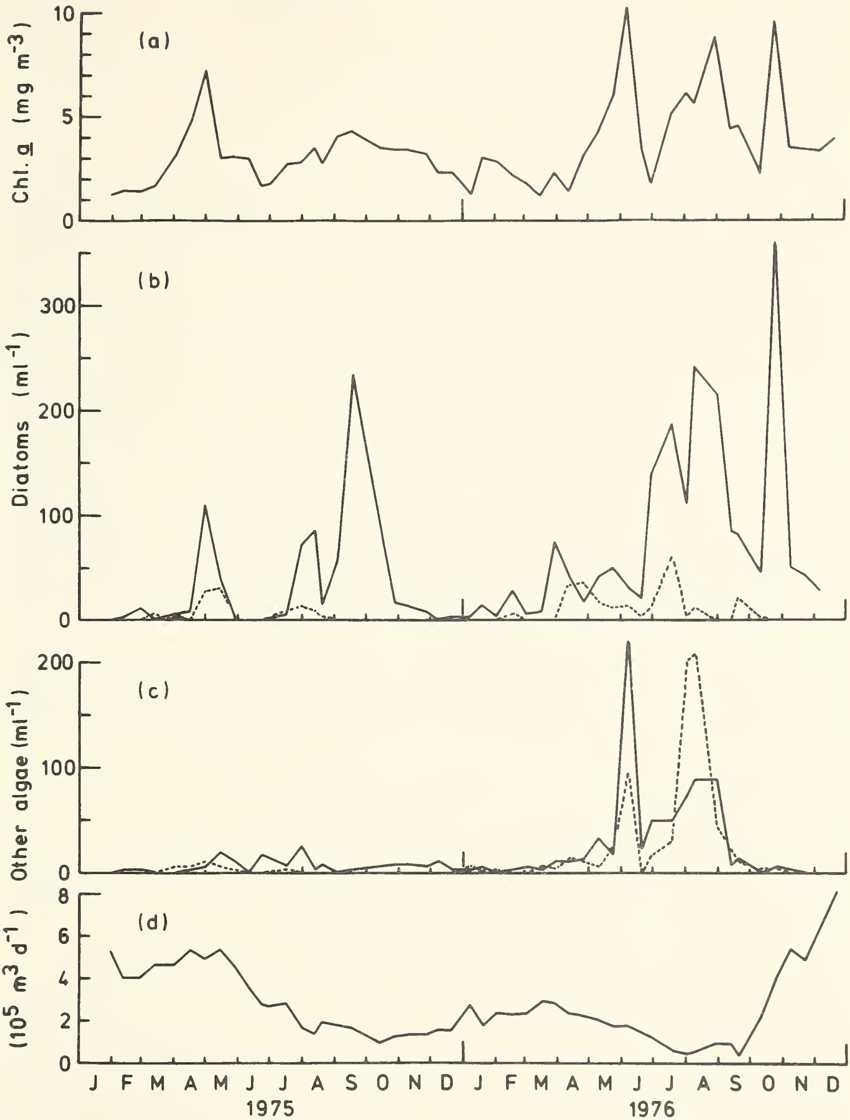

FIGURE 1

Phytoplankton in the R. Hull at Bethell's Bridge, Hempholme, 1975–76. (a) Concentration of chlorophyll *a*; (b) concentration of pennate diatoms (solid line) and centric diatoms (dashed line); (c) concentration of flagellate cells (solid line) and non-motile Chlorophyta (dashed line); (d) discharge.

column, reaching a maximum of *c*. 3000 filaments l^{-1} on 8 June. Hence a proportion of the chlorophyll *a* peak recorded in June 1976 was due to this *Oscillatoria* species.

In absolute terms the algal-cell concentrations found at Bethell's Bridge were, like the

chlorophyll *a* concentrations, generally less than reported for larger lowland rivers. The R. Hull concentrations were only marginally less than those found by Swale (1969) in the upper R. Severn where total algal-cell concentration rarely exceeded 1000 cells ml^{-1}. They were, however, notably less than in Lee (Swale, 1964), Stour and lower Severn (Swale, 1969), Thames (Lack, 1971) and Avon (Moore, 1976) where concentrations markedly greater than 10,000 cells ml^{-1} have been recorded.

The preponderance of pennate diatoms in the R. Hull, and the unimportance of centric diatoms, suggests that the phytoplankton consists mainly of algae which have been released from surfaces within the river. The lack of a substantial community of truly-planktonic algae in what is in many ways a typical lowland river may be a result of the Hull being a short river (Bethell's Bridge is only *c*. 17 km downstream of the source) which is largely fast flowing and hence has too short a retention time to allow significant cell division within the plankton. It is unlikely that shortage of inorganic nutrients inhibits the development of phytoplankton because adjacent reservoirs, which are filled from the river, develop, abundant phytoplankton typical of eutrophic waters, including dense blooms of *Aphanizomenon flos-aquae* (L.) Ralfs.

The peak levels of pennate diatoms (Fig 1b) did not necessarily coincide with high discharge (Fig 1d). In particular the peaks in September 1975 and August 1976 occurred when discharge was low, hence enhanced release of cells to the phytoplankton presumably depended on the state of the attached community rather than on increased erosion brought about by increase in water flow. The pennate diatom peaks of May 1975 and October 1976 did, however, coincide with high or increasing discharge and it is interesting that the same species was most abundant on both occasions (i.e. *S. ulna*). In summer 1976 raised concentrations of flagellate cells and non-motile Chlorophyta, and modest increases in centric diatoms, were observed (Fig 1b, c). These coincided with the exceptionally low levels of discharge which were found in that very dry summer (Fig 1d). It is possible that these algae were truly planktonic and were able to develop during this period because the retention time was unusually prolonged.

Acknowledgements

I am grateful to Erica Swale and Hilary Belcher for identifying diatoms, to Sheila Fidling for technical assistance, and to the Yorkshire Water Authority for supplying analytical results and discharge data.

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AUTUMN FUNGUS FORAYS, 1978–1980

Ilkley, 14–18 September 1978 V.C. 64
Hull, 13–17 September 1979 V.C. 61
Sedbergh, 11–15 September 1980 V.C. 64 and 65

T. F. HERING

In 1978 we used a workroom at Ilkley College of Education, and worked over ground previously visited in spring 1977. Including local colleagues, the total attendance was twenty-five. For the other two forays, the territory was less familiar and accessible, and each had an attendance of about fifteen. The 1979 foray was based at Hull University, and included a visit to Spurn Point. Predictably, this site produced a small fungal list, but it included two very interesting small basidiomycetes with *Ammophila*; an unnamed *Campanella*, the first British find of this genus, and *Cellypha goldbrachii*, also new to Yorkshire. At Sedbergh we used a workroom in Sedbergh School; the sites included some visited in spring 1979. They were on both limestone and acidic soils, and produced an interesting selection of fungi in spite of thin soil and often exposed sites.

In compiling the lists below I am indebted to Mr W. G. Bramley, Mr J. P. Blunt and Dr M. Storey.

List of Sites

1978	F	=Farnley, SE/227478
	M	=Middleton Woods, SE/120485
	B	=Bolton Woods, SE/077553
	HG	=Hawksworth Gill, SE/158411
1979	H	= Houghton Woods, SE/887367
	B	= Burton Bushes, TA/013397
	K	= Kiplingcotes, SE/915434
	S	= Spurn Point, TA/419149
	R	= Risby, TA/013353
1980	HG	= Hebblethwaite Gill, SD/692933
	DG	= Dovecote Gill, SD/693918
	D	= Dentdale, SD/658898
	N	= Needlehouse Gill, SD/731966
	R	= Ravenstonedale Common, SD/717985
	I	= Ingleton Waterfall, SD/692733
		* = new record for Yorkshire

Myxomycetes

Ceratiomyxa fruticulosa (79) R
Lachnobolus congestus (78) M

Ascomycetes

*Cheilymenia crucipila** (78) F
C. theleboloides (79) B
Dasyscyphus controversus (79) S
D. corticalis (78) B
D. fascicularis (78) B
D. minutissimus (78) M
Diplocarpon rosae (79) B
Endodothella junci (80) N
Fabraea ranunculi (80) N
*Gymnoascus californiense** (79) S
*G. vinaceus** (79) S
*Hymenoscyphus phyllophilus** (79) B
Hypocrea citrina (78) M
Hypomyces ochraceus (78) B
H. rosellus (79) R
Leucoscypha leucotricha (79) H

Mollisia ramealis (80) R
Nectria magnusiana (79) B
N. peziza (79) B
Onygena equina (80) N
*Orbilia comma** (78) B
O. xanthostigma (79) H
Otidea alutacea (80) D
Peziza petersii (78) M
Pezizella chrysostigma (79) R
Taphrina betulae (79) B

Basidiomycetes

Uredinales and Ustilaginales

Puccinia arenariae on *Silene dioica* (78) B
Urocystis anemones on *Ranunculus repens* (78) B

Heterobasidiomycetes

Calocera glossoides (78) B
C. pallidospathulata (78) F, M, B; (79) R; (80) D, N, I
Tremella foliacea (80) N

Aphyllophorales

Calyptella capula (79) B
*Cellypha goldbrachii** (79) S
Clavaria helvola (80) DG
C. vermicularis (80) I
Fistulina hepatica (79) B
Hydnum rufescens (78) B
Hymenochaete corrugata (80) D
*Leptotrimitus semipileatus** (80) D
Oxyporus populinus (78) H
Peniophora pubera (80) D
Phellinus robustus f. *hippophaes* (79) S
Tyromyces caesius (79) R
T. lacteus (79) R

Agaricales

Agaricus xanthodermus (79) S
*Amanita crocea** (78) M; (80) D
A. excelsa (80) N
A. inaurata (80) HG
A. phalloides (78) B, HG
Campanella sp.*(79) S
Collybia erythropus (78) M; (79) B
Entoloma nidorosum (80) HG
Hygrophorus citrinovirens (80) R
H. calyptraeformis (78) F
H. langei (79) K
H. miniatus (79) K
H. nitratus (80) R
H. psittacinus (78) F; (80) R
H. reai (80) R
H. substrangulatus (78) HG
Hypholoma elongatum (80) N
Inocybe grammata (79) H
I. hystrix (78) B
I. petiginosa (80) N
Lactarius hepaticus (79) H; (80) N
*Leccinum roseofractum**(80) D
Leptonia incana (79) K
Marasmius hudsonii (79) B
Mycena amicta (80) N
M. filopes (78) M, B
M. tortuosa (80) DG
M. vitilis (80) I
Nolanea versatilis (80) D
Paxillus atrotomentosus (79) H
P. panuoides (79) H
P. rubicundulus (80) N
Psathyrella candolleana (79) B
Russula claroflava (80) HG, N
R. farinipes (78) F
R. lutea (80) DG
R. nitida (79) H
R. sororia (80) D
R. xerampelina (78) F, M
Tricholoma fulvum (80) D
Tylopilus felleus (79) H

Gasteromycetes

Lycoperdon foetidum (78) M, HG
Mutinus caninus (78) M; (80) I
Sphaerobolus stellatus (78) M; (79) H, B

ANDREAEA IN THE SHEFFIELD DISTRICT

T. L. BLOCKEEL

In a recent note (Blockeel, 1979), I described the occurrence of the moss *Andreaea crassinervia* in the Hebden Valley, noting that this was the only site in South-West Yorkshire (VC 63), from which the genus *Andreaea* had been reported during the present century. I was not aware at the time of Adams' report of *A. rupestris* in the Sheffield district, 'on rocks of Millstone Grit; in streams in woodland below about 1,500 ft. Very local' (Adams, 1956). Unfortunately, Adams gave no specific localities, and his area of study included the extensive moorlands in the Peak District of Derbyshire. I have been unable to locate any sites for *A. rupestris* in South-West Yorkshire, and it remains unconfirmed in the vice-county during the present century. However, I am able to report two new sites for *Andreaea rothii* agg. in the Sheffield district.

In the first site, the *Andreaea* occupies a habitat very similar to that in the Hebden Valley, though less sheltered, and it also agrees with that described by Adams. It was observed in the River Rivelin between Rivelin Dams and Hollow Meadows, on one boulder only, covering several square feet of the more or less horizontal surface of the rock. Some of the patches were embedded in sand. The river at this point has the characteristic bryophyte communities of millstone grit streams, with *Marsupella emarginata, Scapania undulata, Racomitrium aciculare* and *Hyocomium armoricum* in the flood zone, *Fontinalis squamosa* on submerged rock, and *Atrichum crispum* on the banks. The *Andreaea* was clearly within the flood zone, though normally above water. The colony is referable to *A. crassinervia.*

The second site is near Strines Reservoir, again in a wooded clough, but it offers additional features of interest. There is a greater quantity of material than in the Hebden and Rivelin valleys, and much of it is above the reach of any flood water, though all the colonies are on boulders in the stream bed. Further, some of the colonies are clearly referable to *A. rothii* rather than *A. crassinervia*. These two taxa are not separated by some bryologists, and it is notable that at Strines the *A. crassinervia* forms grow in the flood zone and are almost completely black in colour, while the *A. rothii* forms grow higher up the boulders, in association with *Diplophyllum albicans, Racomitrium heterostichum* and *Pohlia nutans*. They are slightly less black, at least when moist, showing some reddish coloration. It seems possible that, in South Yorkshire at least, *A. crassinervia* is an expression of *A. rothii* induced in habitats subject to inundation.

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BOOK REVIEWS

The Oxford Encyclopedia of Trees of the World, edited by **Bayard Hora**. Pp. 288, with numerous coloured illustrations. Oxford University Press. 1981. £12.50.

An attractive and authoritative reference work prepared by numerous authors, which describes the principal trees of the world. Details of structure, distribution, history, ecology, cultivation, diseases and economic uses of the major species, varieties and cultivars of 149 genera are provided, 66 of which are illustrated with distribution maps and with composite artwork panels showing the main characteristics of more than 350 species. Introductory matter is given on the form, structure and growth of trees, and on their ecology, management and diseases. Finally, a section on the commercial, local and ornamental value of native trees of Asia, Africa and America, keys to families and the genera described, a glossary, bibliography and indexes are provided.

Jungles, edited by **Edward S. Ayensu**. Pp. 200, with numerous coloured illustrations. Jonathan Cape. 1980. £16.

More than half the world's plant and animal species live in the jungle, which is the provider of food, drugs, fibres, rubber and timber, as well as being a vast storehouse of genetic potential. Alas, jungle rain forests are disappearing at an alarming rate. This book (recommended by the World Wildlife Fund) effectively displays the richness of the ecosystem, and reinforces the need for launching the campaign by international conservation organizations in 1980 to save one of our most important natural assets.

Tundra Ecosystems: a Comparative Analysis, edited by **L. C. Bliss, O. W. Heal** and **J. J. Moore**. Pp. xxxvii + 813, with numerous line drawings and tables. Cambridge University Press. 1981. £55.

The latest volume (no. 25) in the International Biological Programme's detailed treatment of ecosystems deals with the evolution of tundra, the estimation of its plant and animal production, the decomposer cycle and flow of nutrients, the effects of man, and a consideration of conservation.

Thonner's Analytical Key to the Families of Flowering Plants by **R. Geesink, A. J. M. Leeuwenberg, C. E. Ridsdale**, and **J. F. Veldkamp.** Pp. xxvi + 231. Leiden University Press, The Hague. 1981. $37 cloth, $21 paper.

Franz Thonner (1863–1928) was an Austrian about whom very little is known; indeed in the brief sketch of his life in this work he is said to have 'remained virtually unknown both in life and death'. He had both a predilection for, and an expertise in, the construction of keys for the identification of flowering plants. These included keys to European genera and to African genera. In 1891, when only twenty-eight, he published (at his own expense) a key to the families of flowering plants of the world. This was an achievement so daunting in its execution that no one previously had attempted such a task, and even today the number of comparable treatises can be counted on the fingers of one hand.

The present volume is a translation of the second edition of Thonner's key, published in Berlin in 1917, wherein the deficiencies of the original issue were largely corrected and to which families newly recognized since 1917 have been added. There are in all over 2100 couplets and though it may not be necessary to progress through more than a fraction of these in order to reach one's goal, these are still a formidable number of steps to take, any one of which if wrongly taken will lead to disaster. But such is the way with dichotomous keys and we are at least warned at crucial steps in this key to '*read very carefully!*'

This is not a work for amateur botanists. No pronouncement upon its merits could be made without prolonged testing with a wide range of specimens. The best recommendation would seem to lie in the fact that extensive use has for a long time been made of it in Dutch universities and experience there is said to have shown it to be the most reliable work of its kind in existence.

WAS

Fungi by **Roderic Cooke**. Pp. 159 (including line drawings), plus 16 pp. of b/w photographic plates. Collins Countryside Series. 1980. £4.95.

Only a brave man would attempt to follow in the footsteps of John Ramsbottom, whose excellent *Mushrooms and Toadstools* (Collins' New Naturalist series, 1963) provided a popular and authoritative account of these fascinating plants. It is to Roderic Cooke's credit that his book will provide a worthy companion to its predecessor. The present work presents an interesting text, supported by clear line drawings and photography, which gives a stimulating introduction to the subject; no attempt has been made, however, to cross-reference the information to published sources, and only a short, highly selective reading list is appended.

Trees and Woodland in the British Landscape by **Oliver Rackham**. Pp. 204 including line drawings, plus 8 pp. of b/w photographic plates. Dent. 1981. £4.95, paperback.

A very welcome paperback edition of a lively and authoritative account of the role of trees in the British landscape since prehistoric times. Highly recommended to a wide audience.

The Shaping of Cambridge Botany by **S. M. Walters**. Pp. xv + 121 (including 84 b/w illustrations, bibliography and index), plus coloured frontispiece. Cambridge University Press. 1981. £17.50.

Max Walters gives an entertaining account, suitably laced with anecdotal material, that traces with the aid of new data from the University's archives, the development of the study of botany, and particularly of the Botanic Garden, at Cambridge. It is a fascinating subject area, but unfortunately the potential is not fully achieved. The book provides only a brief history of botanical and horticultural science at Cambridge, and post–1945 developments occupy no more than five pages.

The text is complemented by numerous interesting illustrations. However, since many of these have been relegated to the wide margins of the text pages the definition and impact have been lost: the luxuriance of a tree, or the detail of a laboratory or rock garden cannot be fully appreciated from a 2″ × 2″ picture.

A delightful, but expensive introduction, which leaves plenty of scope for a more definitive work on the subject.

MRDS

A Handbook for Naturalists, edited by **Mark R. D. Seaward**, assisted by **Susan Joy** and **Frank H. Brightman**. Foreword by the Duke of Edinburgh. Pp. 202, including numerous monochrome photographs. Constable. 1981. £4.95.

A really invaluable reference book for the budding naturalist, whether young or old, being specifically intended to assist not only the youngster, but also the older novice perhaps taking up a new interest in retirement. It provides a wealth of useful information in a handy small format, which even the more experienced naturalist may well find helpful to have so conveniently collected together. Chapters on many aspects of natural history include practical advice on methods and equipment, supplemented by extensive and well-chosen bibliographies and information on relevant societies. Strongly recommended to anyone taking up the study of natural history for the first time.

VAH

Energy and the Fate of Ecosystems: Supporting Paper Number 8 of the Study of Nuclear and Alternative Energy Systems, by the Ecosystem Impacts Resource Group Risk and Impact Panel of the Committee on Nuclear and Alternative Energy Systems. Pp. xvii + 399. National Academy Press, Washington D.C. 1980. $9:75.

This volume contains thirteen papers which explore the likely environmental effects arising from the development of various types of energy supply, together with a useful introduction and concluding section. A broad approach is taken, with sections covering hydroelectric power, geothermal developments, opencast mining for coal and shale oil, restoration of opencast workings in dry temperate environments, and solar power developments. All the work is firmly set in the North American context. Besides the impact of mining, dangers arising from the transportation of oil are covered and there are two sections dealing with the effects of combustion and other air pollutants on vegetation and forest ecosystems. The tundra is singled out as a particularly vulnerable ecosystem and the dangers posed to it by a range of developments are presented. In the final sections, the possible effects of enhanced energy usage in agriculture, transportation and other uses are discussed.

Though the various papers have different approaches, they all spell out each consideration in a lengthy fashion, usually at a level which could be readily understood by the non-specialist. There are abundant references to relevant papers, though most refer to the period 1970–75. Some papers contain a great deal of valuable information, but overall it is not concisely presented and often there is little attempt to discriminate between major and what are likely to be fairly minor effects. However, the papers will provide the ardent conservationist with a wealth of examples of potential dangers to the environment which may arise if various energy policy options are adopted.

DEC

Other publications received:

A Key to the Caseless Caddis Larvae of the British Isles with Notes on their Ecology by **J. M. Edington** and **A. G. Hildrew**. Pp. 92 (including 152 figures) + 4 plates. Freshwater Biological Association, Scientific Publication No. 43. 1981. £3. Available from: Freshwater Biological Association, The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP.

Birds Around Wakefield 1974–1979 by **Richard L. Brook** and **Peter Smith**. Pp. ii + 186. Wakefield Naturalists' Society. 1981. £2.50 (including postage) from: Richard L. Brook, 48 Blacker Lane, Crigglestone, Wakefield WF4 3EW.

The Sorby Record, edited by **Derek Whiteley**. Pp. 94, illustrated. Sorby Natural History Society, Sheffield. No. 18, 1980. £1.10 (including postage) from: Derek Whiteley, c/o Sheffield Museum, Weston Park, Sheffield S10 2TP.

Nature Stored Nature Studied. Collections, conservation and allied research at the British Museum (Natural History). Pp. 64, including numerous sepia and b/w plates. 1981, £2.75 (including postage) from: Publications, British Museum (Natural History), Cromwell Road, London SW7 5BD.

Hebridean Naturalist. Magazine of the Western Isles Natural History Society edited by **Janet A. Crummy**. Pp. 75, including b/w plates and line drawings. No. 5, 1981. Unpriced, from: Janet A. Crummy, 17 Tolsta Chaolais, Isle of Lewis, Scotland.

The Magpie. Sheffield Bird Study Group. Edited by **D. Herringshaw** and **K. V. Tayles**. Pp. ii + 69, including many line drawings, tables, etc. No. 2, 1981. £1.50 (including postage) from: Kenneth R. Crooks, 44 Peterborough Road, Lodge Moor, Sheffield S10 4JE.

CONTRIBUTORS

INDEX

Compiled by Christine Shaddick

BIRD PROTECTION

Members of the Union cannot fail to be aware that there is a special Y.N.U. committee dealing with bird protection, but few, I suspect, know of it as more than a name on the members' card. Yet for ninety years, it has been, and continues to be, one of the most vital bodies within the Union. It grew out of the bird protection work initiated in Yorkshire in 1868 (some twenty years before the beginnings of the R.S.P.B.) and was formally established in 1891. Before the turn of the century funds were being collected to pay watchers and to protect rare species in the county. Minute books are extant continuously from 1906.

Even since the setting up of a regional representation network of the R.S.P.B., with whom it works very closely, the role of the Y.N.U. Protection of Birds Committee and the need for it have not lessened. Much of its work goes unsung and indeed some of it cannot be divulged without reducing its effectiveness. Although not taking legal action itself, the committee's investigations have frequently been preliminaries to proceedings taken by the police, R.S.P.C.A. and R.S.P.B. Some indication of the amount of work involved can be gauged from the fact that the most recent committee meeting lasted no less than 3¾ hours — and it was all devoted to uninterrupted and vital discussions. Most of the work takes place outside committee meetings, much in the field.

My purpose in writing is twofold. Firstly to make members aware that the Protection of Birds Committee is still a vital and (quietly) active part of the Union and secondly to appeal to both individual members and affiliated societies for their support. The help we need is again twofold. If you know or suspect any illegal activities relative to wild birds, their nests or eggs, please contact the secretary or other member of the committee immediately. Additionally, the committee needs the sort of financial support which individuals and societies used to contribute annually towards the protection of Yorkshire's birds. Old copies of *The Naturalist* show that as long ago as 1908, no fewer than seventeen societies were making generous contributions showing the value they placed on this work.

No appeal for such support has been made since 1967. With the appointment of Clive Varty as secretary of the Protection of Birds Committee the work is being tackled with renewed vigour, and inevitably also costing more. In 1980 expenditure ran to £33.42; in the first three months of 1981 it had already reached £18.23. The contribution which is made in time, energy, and travel, postage and phone expenses by both officers and ordinary members is considerable and for the most part is borne by them. Many individuals also give freely of their time and travel to act as watchers at important sites. Individual members of the Union who are willing to make some contribution to the funds of the Protection of Birds Committee should send it to the treasurer, Miss Margaret Sanderson, 7 Stray Walk, Harrogate HG2 8HU. If a member of an affiliated society, can you please also persuade your society to send a donation towards the cost of active bird protection measures.

R. F. Dickens

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